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Neotropical red-brown Ennominae in the genera *Thysanopyga* Herrich-Schäffer and *Perissopteryx* Warren (Lepidoptera: Geometridae)

MARTIN KRÜGER*

Department of Pure and Applied Biology, University of Wales College of Cardiff, P.O. Box 915, Cardiff CF1 3TL

MALCOLM J. SCOBLE

Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD

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* Current address: Transvaal Museum, P.O. Box 413, Pretoria, 0001 South Africa.

Synopsis. The neotropical genera *Thysanopyga*-Herrich-Schäffer and *Perissopteryx* Warren (Geometridae: Ennominae) are redefined and their species taxonomically revised and described. All primary types available have been examined. Twelve species are included in *Thysanopyga*, of which three are new, and two new synonymies are made. Twenty-four species are included in *Perissopteryx*, of which 15 are new, and one new synonymy is made. Eight new combinations are proposed for species transferred from *Thysanopyga* to *Perissopteryx*. Keys are provided to the genera and species. The moths are illustrated to show appearance and intraspecific variation. Line drawings of the genitalia are provided for all species.

INTRODUCTION

Thysanopyga and *Perissopteryx* are two among several superficially similar genera of medium-sized, reddish-brown Ennominae from tropical America including *Petelia* Herrich-Schäffer, *Lobopola* Warren, *Oenoptila* Warren, and *Oenothalia* Warren. With 39 species, *Thysanopyga* constitutes one of the largest of these genera. Most of them were erected in the 19th century, and based upon externally visible characters alone (e.g. wing-venation, form of antennae and palpi, development of tibial spurs). However, recent work by D.C. Ferguson (in prep.) on the reddish brown Ennominae of the southeastern subtropical part of North America and the Caribbean has revealed radical differences in the genitalia of otherwise similar species. In the present study, which has included an examination of male and female genitalia and wing venation, besides externally visible characters, it was found that a close relationship exists between *Thysanopyga* and *Perissopteryx* but not between these genera and the others.

A detailed study of the species has led to the resolution of numerous nomenclatural problems. Several species are transferred from *Thysanopyga* to *Perissopteryx*, while various others, previously assigned to these genera, were found to belong to neither and are removed.

This research on two neotropical genera has doubled the number of known species in these groups from 18 to 36. Although 21 new names were listed as species in previous literature, three proved to be synonyms; 18 new species are added in the present paper.

Our account was stimulated, in part, by a major project to inventory the moths (and other organisms) of Costa Rica. The purpose of the national inventory of Costa Rica is to provide basic information to facilitate the use of wildland biodiversity information (D.H. Janzen, pers. comm.). However, taxonomy knows no national boundaries, and effective revision of these moths (as with others) is undertaken only by studying material from as broad a range as possible.

TAXONOMIC HISTORY OF THE *THYSANOPYGA*-GROUP

The genus *Thysanopyga* was erected by Herrich-Schäffer in 1855. Although the name was available from that year, no species were included until 1856 (Herrich-Schäffer, [1856]), when *T. apicitruncaria* was described (type species by subsequent monotypy) (Fletcher, 1979). The original description (Herrich- Schäffer, 1855: 43) deals effectively with the facies of the group. Referring to the fore wing venation, Herrich-Schäffer correctly stated that vein R1 (his vein 11) is free.

Between 1890 and 1910, some 30 further species were described in *Thysanopyga*, mostly by Warren, Schaus, Druce, and Dognin. Many of these are excluded from the *Thysanopyga*-group in the present work (Appendix 1).

In 1857, Guenée (1857: 137) described a new genus *Pachydia*. As was usually the case, Guenée described only the facies, which he appropriately indicated to be characteristic, but not the venation. He included three species in *Pachydia*, *abdominaria* Guenée, *pygaria* Guenée, and *vexillaria* Guenée. The last of these species is currently included in *Petelia* Warren. Fletcher (1979) designated *P. abdominaria* as the type species of *Pachydia*. In the present study we conclude that this species is not, as previously assumed, a junior subjective synonym of *Thysanopyga apicitruncaria* (as suggested by Fletcher, 1979), but a distinct, although closely related, species. However, we agree with Fletcher (1979) that the two species are congeneric and that, consequently, *Pachydia* is a junior subjective synonym of *Thysanopyga*.

Perissopteryx was erected by Warren in 1897 to

accommodate a new species, *P. delusa* Warren. Warren (1897: 497) stated that the genus was closely related to *Thysanopyga* in a description in which he also noted the presence of the distinctive flap on the inner margin of the hind wing in the male sex (see below). The venation was also described.

MATERIALS AND METHODS

This study is based on material from The Natural History Museum, London, U.K. (BMNH), the National Museum of Natural History, Washington, U.S.A. (NMNH), and the Instituto Nacional de Biodiversidad, San José, Costa Rica (INBio).

Over 500 adult specimens were examined during the course of this study, including all available primary types. About 350 of these were received from INBio and collected by Professor D.H. Janzen and his associates. More than 370 genitalia slides were prepared. No material was located for '*Thysanopyga*' *subpusaria* Herrich-Schäffer, *T. palliata* Warren, or *T. fuscaria* Schaus (see Appendix 1).

ABBREVIATIONS OF INSTITUTIONS

BMNH The Natural History Museum, London, U.K. (formerly British Museum (Natural History))

INBio Instituto Nacional de Biodiversidad, San José, Costa Rica

NMNH National Museum of Natural History, Washington, D.C., U.S.A. (formerly United States National Museum, USNM).

ACKNOWLEDGEMENTS. We are very grateful to Dr D.C. Ferguson for his valued advice on this work, for his comments on the manuscript, and for organising the loan of material from the NMNH, and Dr J.D. Holloway for his comments on the manuscript. Professor D.H. Janzen supplied a very substantial number of specimens, collected by him and his associates, via the INBio. We are indebted to him for his support, to the other collectors, and to INBio. We thank Mr D.J. Carter, Mr M.A. Cook, Mr M.R. Honey, and Mrs L.M. Pitkin for their help, and the Photographic Units of the BMNH and of the Department of Pure and Applied Biology, University of Wales, College of Cardiff for photographic work. Dr J.E. Rawlins, Carnegie Museum of Natural History, Pittsburg, kindly supplied details of the hostplant of *Thysanopyga carfinia*, which represents the only information known about the hostplants of members of the *Thysanopyga* group. We thank the Trustees of the BMNH for facilities.

M.K. is very grateful to Dr M.A. Jervis, Department of Pure and Applied Biology, University of Wales, College of Cardiff, for his help during the course of this work, and to Professor M.F. Claridge, the Head of that Department, for granting facilities at Cardiff.

TAXONOMIC CHARACTERS

Characters from the wing venation and the genitalia, especially those of the male, were found to be of particular value for the definition of genera and the separation of species.

Wing venation

Although Warren and Herrich-Schäffer based their generic descriptions largely on differences in wing venation, both Janse (1932) and Capps (1943) warned that the variability of venation, even within species, presents a major obstacle towards a more satisfactory classification of the Ennominae. For example, and in particular, variation occurs in the anastomosis of R1 with Sc or with R2. With this observation in mind, a few specimens of the type species, and a single specimen of each of five additional species of *Thysanopyga* and *Perissopteryx*, were examined. At least in these two genera the venation appears to be constant with Sc being free in *Thysanopyga* (Fig. 108) while anastomosing with R1 in *Perissopteryx* (Figs 109, 110). This difference in the venation was apparent to Prout (1910: 300), who noted that in *Thysanopyga strigata* Warren the venation was the same as in *apicitruncaria*, Sc being free rather than anastomosing with R1 as occurs in *divisaria*. (In the present study, *divisaria* is transferred to *Perissopteryx*.)

Genitalia

In *Thysanopyga*, as revised in this work, the shape of the vinculum, the presence of lateral processes on the tegumen of males of the *carfinia*-group and, particularly, the development of the sacculus, are of great diagnostic value both for the separation of species and for characterizing the genus as a monophyletic taxon.

In *Perissopteryx,* more variation is exhibited by both the male genitalia and, especially, by the

female genitalia. Within *Perissopteryx*, the genital morphology provides evidence for the existence of several, possibly monophyletic, species-groups (see below). The only character to support the monophyly of the genus is the form of the vinculum. As in *Thysanopyga*, it is extremely elongated; however, unlike the situation in *Thysanopyga*, its basal region is not lyre-shaped (but see p. 97), and the saccus takes the form of a more or less prominent tip or of a sclerotized plate.

Other characters

Wing-shape and markings, also of taxonomic value, are prone to convergence. For example, the white blotch near the apex of the fore wing found in all species of *Thysanopyga* and *Perissopteryx* is similarly developed in some species of *Astygisa* Walker (= *Apopetelia* Wehrli), although the genitalia suggest that there is no close relationship between these genera.

The males of the *Perissopteryx delusa*-group are characterized by a large flap on the hind wing, which is folded along the anal edge underneath the hind wing (Figs 111–113). The males of some other similar species of *Perissopteryx* may be distinguished, without dissection of the genitalia, by the absence or presence of tibial hair-pencils.

The taxonomic value of coremata is limited since these structures tend to be present or absent in species within the same genus. However, they are occasionally useful for separating species, as in *Perissopteryx divisaria* (recombined with *Perissopteryx* below), in which they are present, and *P. trinidadicola*, in which they are absent.

ASSOCIATION OF THE SEXES

Correct association of the sexes was problematical in some species, notably the medium-sized representatives of *Perissopteryx*, where males and females look so similar. Usually, this difficulty was overcome by studying the range of variation of colour pattern of one sex, generally the male, and then, by comparison, associating the other. Distributional data were also useful, since pairs of similar species sometimes proved to be allopatric. However, the identity of the females remains uncertain in *P. neougaldei* and *P. bozae*.

TYPE-SPECIMENS

Where possible, the primary types of the species dealt with in the present work were studied to resolve questions of identity. In some species, the type appears no longer to exist, and in others damage to the type was so extensive that a definite identification proved difficult. Details are given under the relevant species.

The type material of new taxa described in this study is variously deposited in the following institutions: The Natural History Museum, London, U.K. (BMNH) and the Instituto Nacional de Biodiversidad, San José, Costa Rica (INBio).

COMMENTS ON SKELETAL MORPHOLOGY

Head (Figs 102–104)

The head of *Thysanopyga* and its relatives is typically macrolepidopterous. The compound eyes are large, strongly convex, and possess neither interfacetal hairs nor 'lashes'. These conditions are typical of Geometridae, but in some species, especially diurnal forms such as Archiearinae, the eyes are small. Yagi & Koyama (1963) described the eyes of Geometridae as being short ellipsoids displaying a wide range of ground colours. Interfacetal hairs are almost always absent from Geometridae, but where present, they are said to be somewhat dense and short. External ocelli are absent. Chaetosemata, consisting of approximately 20 sensory hairs of varying lengths, occur in the *Thysanopyga*-group. The vertex and the scape of the antenna are thickly clad in recumbent scales, and the frons is also smooth-scaled, but the scaling less dense. In all species examined, the scales on the vertex are paler than those on the frons. The antennae of males of the *Thysanopyga*-group are bipectinate for the first two-thirds of their length; the apical third is ciliate. In females, they are ciliate throughout their length, not bipectinate.

As is typical in macrolepidopterans, the maxillary palpi are very small and 1-segmented. The labial palpi vary greatly in size between families. Although usually small in Geometridae, they are fairly large and stout in the *Thysanopyga*-group, and 3-segmented with segment 3 short. The proboscis is very well developed and, as in all Geometridae, not scaled at its base.

Thorax

The thorax of species of the *Thysanopyga*-group is typically lepidopterous, with a very much reduced prothorax, a rather small metathorax and a very large mesothorax. Dorsally, the thorax is dominated by the mesoscutum, which bears a distinct median suture, and the mesoscutellum. The pronotum is minute, but the patagia are well developed. In lateral view, the tegulae are particularly prominent. The pronotum is hidden between the patagia, and the propleura and the lateral posterior arm of the pronotum are clearly distinguishable. The episterna and the epimera of the meso- and metathorax are also well defined.

LEGS (Fig. 105). In the *Thysanopyga*-group the legs are typically geometrid—smooth-scaled, slender, and with long tarsi. The tibial spur arrangement is 0-2-4, as occurs in most macrolepidopterans. Each fore leg bears an epiphysis. The hind tibiae of the males of many species are dilated and bear hair-pencils or brushes (e.g. *P. ochreobarbipes*, Fig. 105), presumably for scent distribution.

WINGS (Figs 106–110). The wings of Geometridae are broad compared with the size of the body. They are often cryptically coloured and frequently display some or all of the following lines: subbasal, antemedian, median, postmedian, subterminal, and terminal. All species of the *Thysanopyga*-group show great uniformity in their line pattern. While three lines (subbasal, median, postmedian) occur on the fore wing, the hind wing regularly bears only the median line and, rarely, a weakly developed postmedian line (Fig. 106). A discal spot on the fore wing is present in most species (Fig. 106). On the underside (Fig. 107), the lines are not usually visible, but a broad terminal shade is usually present. In the fore wing of *Thysanopyga* and *Perissopteryx*, 1 or 2 areoles are present. Wing venation is illustrated in Figs 108–110. Vein Sc is close to, or partly fused with, R1; R4 and R5 are always stalked. M2 does not arise nearer to M3 than M1, CuP is absent, and 1A+2A sometimes has a small basal fork. In Geometridae in general, the hind wing of most females possesses 2 or more frenular bristles, while there is a single, but composite, bristle in males. The humeral angle is usually expanded, and a humeral vein is often present from the angle of Sc. Vein Sc is approximated to, or fused with, Rs near its base, or joined to Rs by R1, and then diverges. M2 is absent, or, as in the fore wing, does not arise nearer to M3 than M1. The anal area is narrow, and 1 or 2 anal veins are present.

Abdomen

The geometrid abdomen is generally slender. Segments A7 and A8 house the genitalia and are more or less modified for this purpose. In the *Thysanopyga*-group, the pleura of these segments frequently form eversible pouches, while the sterna are equipped with additional sclerotizations to support the often very large coremata, which occur widely in males of the *Thysanopyga*-group. A pair of tympanal organs (Fig. 114) are situated at the base of the abdomen near the junction with the metathorax (see below).

The tympanal organs of the *Thysanopyga*-group (Fig. 114) are typically geometrid in general structure (e.g. Kennel & Eggers, 1933; Minet, 1983; Cook & Scoble, 1992). Apart from their location, they have a sclerotized arm (*ansa*), which curves over the tympanum. Abdominal sterna A2 and A3 fuse to form a large sclerotized plate, which supports the tympanal cavities. This plate is reasonably well developed in all species studied, and perhaps best in the *Perissopteryx delusa*-group (Fig. 114). However, the tympanic lacinia (see Cook & Scoble, 1992), a lid-like sclerite partly covering the tympanal cavity, and which often occurs in Geometridae, is absent.

A great diversity of scent organs, frequently connected with eversible structures, is found within the Lepidoptera. Attention has already been drawn (p. 81) to the hair-pencils present on the hind tibiae of many species. Eversible structures have been universally termed coremata, but this word covers several non-homologous kinds of androconial organs. Here, we follow Janse (1932), (see also Varley, 1962), who restricted the definition of coremata to 'eversible sleeve-like bags sometimes of great length and covered with hairs'.

Coremata (singular, corema) (e.g. Fig. 115) occur exclusively in the male and appear always to be associated with scent-distributing organs such as hair-pencils or patches of modified scales. Although there is very little information on their function based on direct observation in the field (but see Barlow (1982) on *Creatonotos gangis* and Willis & Birch (1982) on *Estigmene acrea* (Arctiidae)), they are assumed to serve mainly in courtship. It has also been suggested that they may be involved in defence (Rothschild, 1985). Schneider *et al.* (1982) have demonstrated that in species of *Creatonotos*, certain pyrrolizidine alkaloids present in the foodplant control the morphogenesis of the scent organs. In *Thysano-*

pyga the length of the coremata was highly constant within species, an observation based on dissections of several long series.

The irregular occurrence of the coremata, not only among higher taxa of Lepidoptera, but also within genera, suggests that either these structures have been lost many times in the course of evolution or, perhaps more likely, they evolved independently in different parts of the body where this kind of structure could arise (i.e. where there is a membrane and a suitable frame). Coremata occur in the males of many species of Geometridae, including all species of *Thysanopyga* and in a considerable number of species of *Perissopteryx*.

In *Thysanopyga* the coremata are genital, arising from the base of the vinculum. In *T. abdominaria* (Fig. 115), each corema consists of a large tuft of long, broad scales, arising from the membranous parts of the vinculum and a long and fairly narrow tube. Folded together like a concertina when at rest, they are extended from the tip of the abdomen when in use. The tip of the corema bears a tuft of hairs. In the *T. apicitruncaria*-group, both the shape of the scales forming the tuft and the length of the corema varies with species. The tubes are longest in *T. apicitruncaria*, where they measure well over 1 cm.

The scent organs of the *T. carfinia*-group are more uniform. The coremata, which also arise from the base of the vinculum, are generally shorter than in the *apicitruncaria*-group. They are also less hairy and show little variation between species. The tuft of scales at the tip of each corema is absent from the group.

In *Perissopteryx*, the coremata are usually pregenital (Fig. 116); only *commendata*, *distincta*, and *nigricomata* possess coremata arising from the base of the vinculum. In *P. commendata* (Fig. 147), these are long tubes rather similar to the type observed in *Thysanopyga*, while in *P. distincta* and *P. nigricomata* the membranous inner parts of the vinculum form large and short sacs (Figs 149, 150). In both species, the coremata bear long and fine hairs.

In the other species of *Perissopteryx*, frequently one or two pairs of eversible pouches are found ventrolaterally on the abdomen. In the three species of the *delusa*-group, only one pair is present between segments A4 and A5. Each pouch carries a hair-pencil, and grouped around the pouches are several pairs of conspicuous scent-brushes, some of which are readily visible externally in dried specimens.

In those *Perissopteryx*-species possessing pregenital coremata, two pairs of pouches occur. These are situated ventrolaterally on segments A7 and A8; frequently, the anterior pair is larger. These structures are also associated with hair-pencils, not scales. An example showing the pouches and hair-pencils of *P. suffecta* in their original position in the abdomen is given in Fig. 116.

Irrespective of the presence of such pouches, most males of *Perissopteryx* are characterized by the possession of a large hair-pencil on the base of the valva.

MALE GENITALIA. The ventral aspects of the male genitalia of *T. apicitruncaria* and *P. fletcheri*, species representing the two genera, are shown in Figs 117 and 129. In *Perissopteryx* and the *T. apicitruncaria*-group, the tegumen is more or less elliptical and roughly hood-shaped. In the species of the *T. carfinia*-group, however, it is compact and nearly rectangular, and its ventrolateral margin forms one or two pairs of highly characteristic inner projections (e.g. Figs 124, 126). The uncus of the *Thysanopyga*-group, as in many other Lepidoptera, is attenuated and terminates in a fine hook. In some species of *Perissopteryx* a small subapical hook is also present. Below the uncus, paired socii (structures of uncertain derivation) are present in most of the species studied. The gnathos is entirely absent from the *Thysanopyga*-group. The vinculum (i.e. the ventral part of the ring, derived from sternum A9), is more or less U-shaped and rather small in many groups of Lepidoptera. In *Thysanopyga* and *Perissopteryx*, however, the prominently developed vinculum is one of the most characteristic features. The upper dorsal ends of the lateral arms of the vinculum unite with lateral parts of the tegumen termed pedunculi. From the base of the vinculum upwards runs a pair of medial sclerotizations. Posteriorly, these join the juxta and the base of the valvae, so that vinculum, juxta, and valvae seem to form a united complex. The function of these conspicuous sclerotized bands (juxto-vincular sclerotizations) is as yet unclear; they may provide a frame for coremata or hair-pencils or have a role in moving the valvae.

The posterior end of the abdomen is closed by a membranous diaphragma. The aedeagus (intromittent organ) passes through the diaphragma, and is sheathed by it. Within the aedeagus is a membranous, eversible vesica (endophallus) which frequently bears sclerotized structures (notably cornuti) of diagnostic value. The transtilla, a transverse band, and the juxta, a shield-shaped structure, are sclerotizations of the fultura superior and inferior (i.e. the dorsal and

ventral parts of the diaphragma), respectively. Although the juxta is usually crescent-shaped in *Thysanopyga*, its shape is much more variable in *Perissopteryx*, and ranges from nearly rectangular (e.g. Fig. 140) to star-shaped (e.g. Fig. 138).

In the *Thysanopyga*-group, the valvae are mostly simple, but vary considerably in shape. They may be broad and rounded, as in the *P. delusa*-group, or short, narrow, and pointed as in *P. deprivata* Warren. Of special diagnostic importance for *Thysanopyga* is the shape of the sacculus, the basal part of the valva.

FEMALE GENITALIA. The morphological terms adopted to describe the female genitalia of the *Thysanopyga*-group are given for *T. olivescens* (Fig. 161) and *P. commendata* (Fig. 177).

In the *Thysanopyga*-group the lamella antevaginalis and the lamella postvaginalis are not differentiated; a fused sterigma exists. Its shape is often diagnostic (e.g. as in the *T. carfinia*-group). The papillae anales in *Thysanopyga* and its relatives, as in most other groups, are soft, hairy, lobes. In the *Thysanopyga*-group, an appendix bursae, an anterior secondary evagination of the corpus bursae, is present in only a few species. The wall of the bursa may be very delicate or heavily sclerotized. Frequently, it bears one or more sclerotized signa, which are of diagnostic value. Discrete signa are absent, but in most species of *Thysanopyga* the wall of the corpus bursae bears a band or larger area of inwardly directed denticles (spiniferous area).

EARLY STAGES

Other than for a single hostplant record (*Gouania polygama*: Rhamnaceae) for *T. carfinia* (J.E. Rawlins, pers. comm., and see below), no information is available on the early stages of *Thysanopyga* and its relatives.

COMMENTS ON PHYLOGENY

Monophyly of the *Thysanopyga*-group

The pattern of wing markings in members of this group is unique (p. 81). Although in *Astygisa morosa* (Wehrli) and *A. chlororphnodes* (Wehrli) a similar whitish blotch on the apex of the fore wing occurs, the lines are much less well defined. In addition, the great elongation of the vinculum in the male genitalia also appears to be a specialized character.

Monophyly of *Thysanopyga* Herrich-Schäffer

The monophyly of *Thysanopyga* in its revised state is supported by a range of characters from the male and female genitalia. In the male the following characters are considered to be independent specializations for *Thysanopyga*: the presence of a large or very large sacculus; the rectangular to triangular shape of the distal part of the valva, and the lyre-shaped base of the vinculum. In the female, the ductus is long and heavily sclerotized.

Two species-groups exist within the genus. The monophyly of the *apicitruncaria*-group is based, in the male, on the presence of an extremely large sacculus, a single, handle-shaped, median cornutus and a varying number of apical cornuti in the vesica. In the female it is supported by the long, heavily sclerotized and posteriorly undilated ductus, together with the 'leathery' texture of the wall of the corpus bursae.

In the *carfinia*-group the following specializations are found: in the male genitalia, the inner margin of the broad and quasi-square tegumen forms highly characteristic lateral processes. The aedeagus bears a group of apical cornuti only, the median cornutus is presumed to have been lost. The female genitalia exhibit three striking apomorphies. The sterigmata are highly complex and well sclerotized; a large spiniferous area occurs on the corpus bursae as in Figs 159–162; the ductus is massive, heavily sclerotized and consists of a small posterior part, leading to the ostium, and a much larger anterior part. The relative length of the posterior part is of diagnostic value at the level of species.

Monophyly of *Perissopteryx* Warren

The elongated vinculum, in which the saccus can take either the form of a tip or of a sclerotized plate, is an apomorphy for the entire genus. In the female genitalia, such a range of variation in shape and size occurs that no apomorphy from these structures has been recognised for the genus.

The species of *Perissopteryx* are usually less uniform than in *Thysanopyga*, both in facies and in genital morphology. Within *Perissopteryx*, only one monophyletic grouping (composed of the three species of the *delusa*-group) has been recognised. These species possess the following specialized characters: the presence of a special-

ized flap on the underside of the hind wings of the males (Figs 111–113); and the existence of one pair of ventrolateral, eversible pouches on segments A4 and A5, (as opposed to two pairs on segments A7 and A8). Considerable uniformity occurs in the male genitalia.

It is likely that a more detailed study will reveal the existence of further monophyletic species-groups within *Perissopteryx*. For example, in *P. raveni*, *suffecta*, and *intermedia*, the male genitalia, with the exception of the juxta, are very similar and the aedeagus is characterized by a single, needle-like cornutus (Figs 139, 140, 141). A similar cornutus is also observed in *P. distincta*, *albopunctaria*, and *deprivata*, but these species do not possess a star-shaped juxta and display other differences, particularly in the condition of the saccus. They also differ in general appearance. They belong to a group of five species, the position of which is discussed below (p. 97). Another group that may be monophyletic is composed of *P. ochrilinea* and *gamezi*. It is characterized by a distinctive, star-shaped juxta and the presence of short, woolly hair along the ventral margin of the tegumen (Figs 137, 138).

The *Thysanopyga*-group and the tribal classification of the Ennominae

The current tribal classification of the Ennominae is still largely unsatisfactory, and based to a significant extent on regional studies. A good foundation has been provided for the Nearctic Ennominae by the studies of Forbes (1948), McGuffin (e.g. 1972, 1987), and Rindge (e.g. 1975, 1980, 1985), while the Neotropical Ennominae remain far less extensively studied, despite the great diversity of the subfamily in this region.

Attempts to ascertain whether the *Thysanopyga*-group fits into the existing tribal classifications of Ennominae were made difficult because, as indicated above, these are mainly based on Nearctic representatives. Our limited knowledge about the early stages of *Thysanopyga* and *Perissopteryx* was a further limitation, because the existing tribal classifications are partly founded on these characters (Forbes, 1948; Holloway, in prep.).

In the North American literature, *Thysanopyga* has been variously associated with the tribe Caberini (e.g. by Forbes (1948: 70) who also erroneously cited *nicetaria* Guenée as the type species). More recently, Hodges *et al.* (1983) included *Thysanopyga* (with two species, *intractata* and *proditata* Walker) in the Caberini. The species cited are probably correctly placed in or near the Caberini, but *nicetaria*, *intractata*, and *proditata* do not belong to the *Thysanopyga*-group (see Appendix 1).

Holloway (in prep.), tentatively suggests that *Thysanopyga* and *Perissopteryx*, together with others of the reddish-brown genera such as *Petelia* and *Oenothalia*, might eventually be found to belong to the Caberini. However, apparently the only adult character shared by most Caberini, the swollen base of Sc in the hind wing (Forbes, 1948), is not well developed in *Thysanopyga* and its relatives. Also, the male (and to a lesser degree the female) genitalia differ markedly from those of the core-group of Caberini (in the sense of Forbes (1948) and other authors – *Cabera* Treitschke (= *Deilinia* Hübner), *Apodrepanulatrix* Rindge, *Eudrepanulatrix* Rindge, *Drepanulatrix* Gumppenberg, *Erastria* Hübner (= *Syrrhodia* Hübner)).

The exact composition of the Ennominae is uncertain, and classification at the tribal level will remain unsatisfactory until comprehensive comparisons are made across the subfamily. We have been unable to assign the *Thysanopyga*-group to an existing tribe within the Ennominae.

THE *THYSANOPYGA*-GROUP

In general appearance (Figs 1–101, 106, 107) the moths are fairly robust-bodied Ennominae, especially the species of *Thysanopyga* (excepting *strigata* and *prunicolor*) and the *Perissopteryx delusa*-group. The length of the fore wing ranges from 11–21 mm. Although variable in colour, the adults are easily recognized by a combination of features. The apex of the fore wing, which is frequently slightly falcate, is demarcated distally by an off-white convex line. The apex bears a more or less prominent greyish-white apical blotch. Three lines (one subbasal, one median, and one postmedian) are present, although the median line may be only weakly developed. The median area of the fore wing is frequently paler or of a different colour. On the hind wing, usually only the median line is present. Discal spots are found on fore wings and hind wings. The males are frequently, but not always, slightly larger than the females, which they outnumber considerably in light-trap samples.

The species of *Thysanopyga* are mostly brown to purplish-brown, mixed with orange or pinkish-brown to flesh-coloured, mixed with grey. A few species of *Perissopteryx* (*P. commendata*, *deprivata*, *albopunctaria*, *nigricomata*, and *distincta*)

are pure grey and brown with the lines fine and narrow and the different areas of the wing clearly defined (see also p. 97). However, the majority of *Perissopteryx* species occur in two forms: in one, the ground colour is uniformly grey or brown with darker irrorations; in the other it is olive-grey with extensive ochreous markings.

HEAD (Figs 102–104). Eyes large, naked. Ocelli not visible; chaetosemata present. Proboscis well developed; maxillary palpi minute, 1-segmented, obscured by labial palpi. Labial palpi ascending to almost porrect, length 1.0–1.5 times diameter of eye, with segment 3 very small. Head smooth-scaled, scales on vertex often of different colour from those on front of head. Antennae: in male bipectinate on basal two thirds, ciliate on apical third; in female simple, bearing short cilia.

THORAX. Fore leg with epiphysis present. Tibial spurs 0-2-4. Fore wing and hind wing usually concolorous. Discal spots always present on both fore wing and hind wing but sometimes minute. Thorax slender to fairly robust, its vestiture concolorous with wings. Wings coupled by frenular-retinacular system.

Wing venation (Figs 108–110). Fore wing with 12 veins; cell at most half as long as wing. Vein Sc arising from beyond middle to near end of cell, anastomosing or not anastomosing with R1. Veins R2–5 stalked. Areoles absent. Vein M2 arising midway between M1 and M3. Vein CuA1 arising from near end of cell, CuA2 from middle of cell or slightly beyond. 1A+2A normal. Hind wing with 8 veins. Vein Rs closely approximating to, but not fusing with, Sc+R1. Veins M1 and M3 running parallel, or slightly converging for a short distance, towards termen. Vein M2 absent. Vein CuA1 arising from near end of cell, CuA2 arising from beyond middle of cell. Vein 1A normal; 2A well developed and reaching wing margin (*Perissopteryx delusa*-group) or weakly developed and not reaching wing margin (others).

ABDOMEN. Tip of abdomen in male with hair-tuft of varying size. Hair-pencils and coremata occurring in male of many species (see species descriptions).

Genitalia ♂ (Figs 117–151). Uncus fairly straight and robust, of moderate length, rarely long and curved. Socii usually present. Gnathos absent. Valva ranging in shape from narrow and pointed to broad and rounded or rectangular, but nearly always simple; costal arm present only in *Perissopteryx fletcheri*; sacculus well developed and large in *Thysanopyga*, absent in *Perissopteryx*. Juxta usually large, crescent-shaped in *Thysanopyga*, variously shaped in *Perissopteryx*. Tegumen usually without special modifications, elliptical to square, but with conspicuous lateral inner projections in the *T. carfinia*-group. Vinculum large and conspicuous in practically all species, with prominent juxto-vincular sclerotizations; base of vinculum frequently with hair-pencils and coremata. Aedeagus ranging in shape from short and stout to long and thin; cornuti always present on vesica, displaying great variation in size and number.

Genitalia ♀ (Figs 152–178). Exhibiting considerable variation, particularly in the shape of the bursa copulatrix. Papillae anales narrow to broad, soft, hairy. Apophyses anteriores and posteriores well developed, the latter being longer and thinner than the former in most species. Sterigma usually simple, occasionally complex (*T. carfinia*-group). Ductus bursae membranous or sclerotized, varying in length and strength. Corpus bursae membranous to 'leathery' in texture, with appendix bursae present in one species (*P. commendata*); discrete signum never present, but corpus bursae bearing a spinose area of varying size in most species of *Thysanopyga*.

BIOLOGY. The early stages are unknown except for *T. carfinia*. Although adults of species of the *Thysanopyga*-group are observed in all months of the year, there are two distinct seasonal peaks of emergence. One of these occurs from May to August, tending to coincide with the onset of the rainy season, and the second, smaller emergence occurs from November to January. These results are similar to those presented by Janzen (1984) for Saturniidae and Sphingidae in the dry seasonal forest of the Santa Rosa National Park in northwestern Costa Rica.

On the Mato Grosso in Brazil, males of *T. amarantha* Debauche have been observed to visit damp sand and human sweat (label data on specimens from the C.L. Collenette collection). This observation may indicate at least partial diurnalism in this species.

DISTRIBUTION. South America north of approximately 30° S (i.e. from northern parts of Argentina); Central America including southern parts of Mexico; the Caribbean (Trinidad, Grenada), and Cuba, which appears to be the northernmost point of distribution.

Check-list of genera and species of the *Thysanopyga*-group

THYSANOPYGA Herrich-Schäffer, 1855
PACHYDIA Guenée, 1857

apicitruncaria-group
apicitruncaria Herrich-Schäffer, 1856
?*illectata* (Möschler, 1881) (*Cimicodes*)
abdominaria (Guenée, 1857) (*Pachydia*) **comb.n.**
agasusaria (Walker, 1860) (*Hyperythra*) **syn.n.**
bilbisaria (Walker, 1860) (*Caberodes*) **syn.n.**
pygaria (Guenée, 1857) (*Pachydia*) **comb.n.**
amarantha Debauche, 1937
***henneickeae* sp.n.**
***gauldi* sp.n.**
strigata Warren, 1907
prunicolor Warren, 1908
carfinia-group
carfinia (Druce, 1893) (*Pachydia*) **comb.n.**
nigricosta Warren, 1905
***olivescens* sp.n.**
***janzeni* sp.n.**

PERISSOPTERYX Warren, 1897
delusa-group
delusa Warren, 1897
***fletcheri* sp.n.**
***huanucoi* sp.n.**
Other species in the genus
***griseobarbipes* sp.n.**
***ochreobarbipes* sp.n.**
***ugaldei* sp.n.**
***neougaldei* sp.n.**
submarginata (Schaus, 1911) (*Thysanopyga*) **comb.n.**
***submarginatella* sp.n.**
ochrilinea (Warren, 1904) (*Thysanopyga*) **comb.n.**
***gamezi* sp.n.**
***raveni* sp.n.**
suffecta (Warren, 1904) (*Thysanopyga*) **comb.n.**
***intermedia* sp.n.**
***smithi* sp.n.**
divisaria (Walker, 1861) (*Tephrina*) **comb.n.**
***bozae* sp.n.**
***trinidadicola* sp.n.**
***muzonensis* sp.n.**
commendata (Schaus, 1912) (*Thysanopyga*) **comb.n.**
deprivata (Warren, 1909) (*Thysanopyga*) **comb.n.**
***distincta* sp.n.**
nigricomata (Warren, 1901) (*Thysanopyga*) **comb.n.**
muricolor (Schaus, 1911) (*Thysanopyga*) **syn.n.**
albopunctaria (Dognin, 1900) (*Thysanopyga*) **comb.n.**

Key to the genera of the *Thysanopyga*-group

(Based on wing venation and genital morphology.)

1 Sc not anastomosing with R1 in fore wing (Fig. 108). Male with base of vinculum lyre-shaped, always slightly cleft apically; sacculus forming a lobe of varying size (e.g. Figs 117, 124). Female often with broad, sometimes massive, and well-sclerotized ductus bursae and corpus bursae in most species with a spiniferous area. Mostly large species, relatively brightly coloured ..... ***Thysanopyga*** (p. 86)

— Sc anastomosing with R1 in fore wing for a short distance (Figs 109, 110). Male with base of vinculum (saccus) typically drawn into a tip (e.g. Fig. 132) or a sclerotized plate (e.g. Fig. 148); if somewhat lyre-shaped (e.g. Figs 147, 149) then never cleft apically; sacculus absent. Female with ductus bursae rarely so massive, usually much thinner and less heavily sclerotized; corpus bursae without spiniferous area. Mostly smaller, greyish-brown or olive-ochreous species ..... ***Perissopteryx*** (p. 96)

THYSANOPYGA Herrich-Schäffer, 1855

Thysanopyga Herrich-Schäffer, 1855: 109, 123; [1856] 1850–1858: 29, 43. Type species: *Thysanopyga apicitruncaria* Herrich-Schäffer, [1856], by subsequent monotypy.
Pachydia Guenée, 1857: 137. Type species: *Pachydia abdominaria* Guenée, 1857: 138 by subsequent designation (Fletcher, 1979). Synonymized by Fletcher, 1979: 150.

Thysanopyga includes ten fairly large and robust-bodied species and two much more slender-bodied species. The length of the fore wing ranges from 13–21 mm. The adult moths exhibit clearly the line pattern typical of the whole group. The genus is divided into two species-groups based on coloration and differences in the genitalia (see below). Adults of the *apicitruncaria*-group are fairly dark moths, occurring in various shades of reddish purple and brown and frequently marked with orange. *T. strigata* and *T. prunicolor* are exceptional in being small, greyish species. The species of the *carfinia*-group are much paler, mostly pink to flesh-coloured, sometimes mixed with a warm brown, and more or less strongly irrorated with grey.

VENATION (Fig. 108). Vein Sc not anastomosing with R1 in fore wing. In hind wing, A2 weakly developed and not reaching wing margin.

GENITALIA ♂ (Figs 117–127). Distal part of valva broadly rectangular to triangular, never rounded or pointed; sacculus developed, although to a varying degree. Vinculum always lyre-shaped and slightly cleft apically; extended into two processes.

In *T. apicitruncaria*-group male genitalia appearing elongated. Uncus ranging from short and straight to long and curved. Sacculus at least as large as remaining part of valva. Tegumen elliptical in outline, without lateral processes. Juxta crescent-shaped. Base of vinculum with a

large tuft of scales and usually very long coremata. Aedeagus with a single, handle-shaped median cornutus and a group of apical cornuti.

In *T. carfinia* group, genitalia appearing broad. Uncus short and stout. Socii large. Distal part of valva broadly rectangular, hairy over its entire surface; sacculus much smaller than distal part of valva, also hairy. Tegumen very compact, nearly rectangular, and with one or two (upper and lower) pairs of characteristic inner projections. Juxta shield-shaped, roughly triangular. Vinculum generally shorter and broader than in the *T. apicitruncaria*-group, its base lacking the tuft of scales. Coremata short and delicate, carrying a tuft of hairs which is easily lost. Aedeagus generally slender, with apical cornuti only.

GENITALIA ♀(Figs 152–162). Ductus bursae long and stout, well sclerotized. Corpus bursae with or without a spiniferous area.

In *T. apicitruncaria*-group, ostium and sterigma simple, without special sclerotizations. Spines present or absent, but if present, of diagnostic value. Corpus bursae broadly pear-shaped to elongated, its wall tough, with a 'leathery' texture.

In *T. carfinia*-group, sterigmata occur as complex sclerotizations. Ductus bursae compact and heavily sclerotized, consisting of a small posterior and a much larger anterior part. Corpus bursae well rounded, its wall quite smooth, not 'leathery', and with a large spiniferous area in the apical third.

REMARKS. Fletcher (1979) considered the type species of *Pachydia*, namely *abdominaria* Guenée (1857), as a junior subjective synonym of the type species of *Thysanopyga*, namely *apicitruncaria* Herrich-Schäffer, [1856]. He therefore regarded *Pachydia* as a junior synonym of *Thysanopyga*. Although *abdominaria* is reinstated to specific rank in this study, following the examination of the male holotype, the generic synonymy is maintained because the two species are so similar.

Key to species of *Thysanopyga*

(Based on genital morphology.)

1 Tegumen elliptical or broadest near base, its ventrolateral margin without modifications. Sacculus forming a large lobe. Vesica with several apical cornuti and a handle-shaped median cornutus (e.g. Figs 117–119). Corpus bursae with spinose area present or absent; ductus bursae entire, sterigma small and weakly sclerotized. Mostly darker, purplish-brown species, sometimes with orange markings, rarely entirely grey (*apicitruncaria*-group) 2

— Tegumen not elliptical, very compact and nearly rectangular, its ventrolateral margin forming one or two pairs of inner projections. Sacculus markedly smaller than distal part of valva. Vesica with apical cornuti only (Figs 124–127). Corpus bursae with large spinose area; sterigma with complex structure (Figs 159–162). Paler, pinkish-brown species (*carfinia*-group) 9

2 (1) Small (fore wing length 13–14 mm), light grey or dark brown-grey species with indistinct lines (Figs 24–26) 3

— Larger (fore wing length 17–21, rarely 15 mm), reddish- and purplish-brown species with distinct lines (Figs 1–23) 4

3 (2) Medium to light grey, apical blotch indistinct. Male genitalia (Fig. 123): valva with tooth-like process near base, aedeagus with numerous slender apical cornuti. Female genitalia (Fig. 157) with rather short and stout ductus bursae; corpus bursae well rounded ..... **strigata** (p. 93)

— Dark grey, apical blotch distinct. Male genitalia unknown. Female genitalia (Fig. 158) with longer and narrower ductus bursae; corpus bursae irregularly shaped ..... **prunicolor** (p. 93)

4 (2) Distal half of valva broadly triangular (Figs 117, 118, 120), densely hairy over most of the surface. Corpus bursae hardly elongated 5

— Distal half of valva also triangular, but much narrower (Figs 119, 121, 122), densely hairy only along inner margin. Corpus bursae, where known, clearly elongated 7

5 (4) Uncus very long, curved. Vinculum becoming only moderately dilated towards base (Fig. 120). Corpus bursae slightly elongated, with a few large spines (Fig. 154). A very variable, but comparatively brightly coloured species, often light brown with orange ..... **amarantha** (p. 91)

— Uncus much shorter, not so strongly curved. Vinculum becoming much dilated towards base (Figs 117, 118). Corpus bursae irregularly shaped and with a conspicuous lateral outgrowth; without spines (Fig. 153). Sombre-coloured species, usually dark brown and purple 6

6 (5) Male genitalia (Fig. 117) with long, broad aedeagus, with 8–10 apical cornuti on vesica. Juxta forming a long and narrow crescent. Female genitalia (Fig. 152) with large corpus bursae and clearly twisted ductus bursae. Mainly restricted to mainland South America ..... **apicitruncaria** (p. 88)

— Male genitalia (Fig. 118) with aedeagus more slender, with 4 large apical cornuti. Juxta forming a short crescent. Female genitalia (Fig. 153) with much smaller corpus bursae and hardly twisted ductus bursae. Centre of distribution in Central America ..... **abdominaria** (p. 89)

7 (4) Smaller species (fore wing length 15–18 mm), light brown and orange. Sacculus with distal area of large pores. Aedeagus (Fig. 119) with a short and broad median cornutus and two groups of apical cornuti. Female unknown. Recorded from Argentina, Brazil, and Paraguay ..... **pygaria** (p. 90)

— Larger species (fore wing length 18–21 mm), greyish pink and purple or vivid lilac and orange. Sacculus with or without a discrete distal area bearing large pores. Aedeagus either with long, slender median cornutus, with two of the apical cornuti very large (Fig. 122), or, if median cornutus is short, then apical group of cornuti lack two markedly large members. One species restricted to French Guiana, the other to Costa Rica 8

8 (7) Vinculum with small lateral lobes near pedunculi; tegumen and valvae narrow (Fig. 121). Sacculus without a discrete distal area bearing large pores. Juxta arrow-shaped. Aedeagus not unlike that of *pygaria* and *amarantha*. Large species of fiery orange colour, median area lilac. Corpus bursae elongated, without spiniferous area (Fig. 155). French Guiana ..... **henneickeae** (p. 91)

— Vinculum without such lobes, tegumen and valva even narrower (Fig. 122). Sacculus with a discrete distal area bearing large pores. Juxta not arrow-shaped. Aedeagus similar, but the two large cornuti arising apically. Large species, similar in colour to *apicitruncaria*, but paler, especially on median area of fore wing. Corpus bursae elongated; spiniferous area present (Fig. 156). Costa Rica ..... **gauldi** (p. 92)

9 (1) Tegumen with very long inner projections present, but lacking shorter lower inner projections (Fig. 126). Posterior part of ductus bursae very long; sterigma as in Fig. 161. Wings greyish olive, with a faint pink tinge. Costa Rica ..... **olivescens** (p. 95)

— Tegumen with both upper and shorter lower inner projections present (Figs 121, 125, 127). Posterior part of ductus bursae shorter; sterigma as in Figs 159, 160, 162. Wings paler, greyish-pink, mixed with brown. Central America (one species), South America (two species) 10

10 (9) Tegumen with upper inner projections forming a blunt lobe (Fig. 127). Posterior part of ductus bursae very short and stout; sterigma wrinkled (Fig. 162). Mainland South America (Colombia, Ecuador, Brazil) ..... **janzeni** (p. 96)

— Tegumen with upper inner projections acutely pointed (Figs 124, 125). Posterior part of ductus bursae moderately long; sterigma as in Figs 159, 160, not wrinkled. One species restricted to Central America, the other to mainland South America 11

11 (10) Tegumen with upper inner projections angulated, lower inner projections broad (Fig. 124). Sterigma as in Fig. 159. Wings chocolate-brown, irrorated with grey. A smallish species, restricted to Central America: Mexico to Panama ..... **carfinia** (p. 94)

— Tegumen with upper inner projections not angulated, lower inner projections slender (Fig. 125). Sterigma as in Fig. 160. Wing colour as in *carfinia*, but with less grey scaling. Peru and Bolivia ..... **nigricosta** (p. 95)

The *apicitruncaria*-group

Thysanopyga apicitruncaria Herrich-Schäffer, 1856

(Figs 1–4, 117, 152)

Thysanopyga apicitruncaria Herrich-Schäffer, [1856]: pl. 94, fig. 536. Holotype ♂, [BRAZIL]. [Type presumed lost; not examined.]

♂ (Figs 1–3), ♀ (Fig. 4). Fore wing and hind wing concolorous dark brown and purple, in some specimens with orange distal to the postmedian line. Apical blotch moderately well developed. Median area of fore wing purplish, with fine grey striations, interrupted by undulating brown median line. Subbasal line often only poorly developed, also undulating. Hind wing ground colour ranging from brown to purple, always finely striated. Median line broad, not well defined and more like a fascia. Female paler. Underside ochreous with grey irrorations, terminal shade purplish-red, broad. Discal spots weakly developed on underside. Dorsal side of thorax and approximately anterior four abdominal segments rich brown to purple; rest of abdomen ochreous. Fore wing length: ♂ 17–19 mm; ♀ 17–18 mm.

GENITALIA ♂ (Fig. 117). Uncus moderately long, rather narrow, with minute apical hook. Valvae broad, distal part broadly triangular, sacculus forming a large lobe. Juxta large, crescent-shaped. Vinculum very broad at base, narrowing towards tegumen. Coremata very long; hair-tuft prominent, consisting of fairly broad scales. Aedeagus large and broad, with 8–10 apical cornuti and a slender median cornutus.

GENITALIA ♀ (Fig. 152). Papillae anales slender, slightly pointed. Apophyses slender, with posteriores about 1.5 times the length of anteriores. Sterigma inconspicuous. Ductus bursae long, smooth, and conspicuously twisted near middle. Corpus bursae large, slightly elongated, with the lateral outgrowth more to its posterior

part. Spiniferous area absent. Wall of corpus bursae of 'leathery' texture.

DIAGNOSIS. *T. apicitruncaria* is most likely to be confused with *T. abdominaria*, from which it cannot be separated on external features. In the male genitalia, the most useful character is provided by the aedeagus, which in *apicitruncaria* is broader and bears 8–10 rather slender apical cornuti, but in *abdominaria* is more slender and bears 4–5 larger apical cornuti. Also diagnostic is the shape of the juxta, which is longer and narrower in *apicitruncaria*. In the female genitalia, the corpus bursae is larger in *apicitruncaria* and the lateral outgrowth is situated more posteriorly. Also similar in colour pattern are *T. gauldi* and some specimens of *T. amarantha*, but these species are readily separated from *apicitruncaria* by their genitalia. Also, *gauldi* has so far been collected only in Costa Rica.

DISTRIBUTION. Excepting Trinidad, apparently restricted to the South American mainland. Confirmed records include Trinidad, Venezuela, Brazil, and Peru.

REMARKS. The type of *apicitruncaria* H.-S., the type species of *Thysanopyga*, is apparently lost. Since the species was described from a single male, stated to be from Brazil, of which an illustration of reasonably good quality exists (Herrich-Schäffer, [1856]: pl. 94, fig. 536), a holotype is deemed to have been designated (Article 73 (a)(iv) of The International Code of Zoological Nomenclature (1985)). Although Herrich-Schäffer's illustrations are adequate for the identity of many of his species to be fixed satisfactorily, in this instance another species, *T. abdominaria*, previously thought to be a junior synonym of *apicitruncaria*, but here considered to be a good species, is indistinguishable from *apicitruncaria* in external appearance. Moreover, the ranges of the two species also partly overlap. Although the genitalia of the male holotype of *abdominaria* have been examined, obviously those of *apicitruncaria* have not. So it is not impossible that the type of *apicitruncaria* represents the same species as that represented by the type of *abdominaria*. The identity of *apicitruncaria* is established below by applying that name to the other species, thus accepting, implicitly, that Herrich-Schäffer's illustration represents *apicitruncaria* in the sense accepted here, and not *abdominaria*.

Cimicodes illectata Möschler was described from a single male from Surinam (Möschler 1881: 394). In the card index and main collection of the BMNH, it is listed as a junior synonym of *apicitruncaria*, although this synonymy appears not to have been published. The description and illustration given by Möschler could also refer to *abdominaria* and *amarantha*, but the type has not been located.

MATERIAL EXAMINED (7♂, 2♀).
Trinidad: West Central Trinidad, Caparo. **Venezuela**: San Esteban. **Brazil**: Upp[er] Amazons, Fonte Boa. **Peru**: Dept. Amazonas, Chachapoyas.

Thysanopyga abdominaria (Guenée, 1857) **comb.n.**

(Figs 5–8, 118, 153)

Pachydia abdominaria Guenée, 1857: 138. Holotype ♂, BRAZIL (BMNH) [examined].
Hyperythra agasusaria Walker, 1860: 242. Holotype ♂, 'SANTO DOMINGO' [probably DOMINICAN REPUBLIC] (BMNH) [examined]. **Syn.n.**
Caberodes bilbisaria Walker, 1860: 252. Holotype ♀, 'SANTO DOMINGO' [probably DOMINICAN REPUBLIC] (BMNH) [examined]. **Syn.n.**

♂ (Figs 5, 6), ♀ (Figs 7, 8). Colour pattern and markings as for *T. apicitruncaria*, see above, but frequently smaller. *T. abdominaria* is more variable than the type species, and paler specimens, as well as specimens with orange markings on the hind wings and on the postmedian area of the fore wing, occur. Fore wing length: ♂ 15–18 mm; ♀ 17–18 mm.

GENITALIA ♂ (Fig. 118). Very similar to *apicitruncaria*. In *abdominaria* the juxta is shorter and broader, and the aedeagus more slender bearing 4–5 apical cornuti instead of 8–10. Median cornutus less curved.

GENITALIA ♀ (Fig. 153). Papillae anales stout and blunt. Apophyses slender, with posteriores about twice the length of anteriores. Sterigma inconspicuous. Ductus bursae long, smooth, well sclerotized. Corpus bursae of medium size, slightly elongated, of irregular shape, with a conspicuous lateral outgrowth near the middle; spinose area absent; wall of corpus bursae leathery.

DIAGNOSIS. The wing markings and the male genitalia are extremely similar to those of *apicitruncaria*, but the moths are usually slightly smaller. The differences in the male and female genitalia are described under *apicitruncaria*.

DISTRIBUTION. Confirmed records (i.e. speci-

mens which have been dissected) exist from Cuba, Costa Rica, Ecuador, and Brazil. The Dominican Republic seems also to be a likely area (see Remarks). Although the species was described from Brazil, and has also been collected from Ecuador, it seems to be predominantly Central American in distribution. In a series of over 70 specimens collected in Costa Rica, dissection of over 15 specimens failed to reveal a single specimen of *apicitruncaria*; all were *abdominaria*. Similarly, all Cuban specimens examined were found to belong to *abdominaria*.

REMARKS. Both *Hyperythra agasusaria* and *Caberodes bilbisaria* were described in 1860 by Walker from 'Santo Domingo'. Although this is a very common place name in Latin America (Columbia-Lippincott, 1962), it is believed that Walker's 'Santo Domingo' refers to what is known today as the Dominican Republic (D.C. Ferguson, pers. comm.).

MATERIAL EXAMINED (79♂, 13♀).
Holotype ♂, **Brazil**: (*abdominaria*) *Abdominaria* Gn.; Ex Typicalibus Speciminibus; Ex Musaeo Ach. Guenée; *Pachydia abdominaria*, Guenée (Sp.G. X no.1145) boîte 255 [handwritten]; Ex Oberthür Coll. Brit. Mus.1927–3 (genitalia slide No. 14344) (BMNH). Holotype ♂ (*agasusaria*), **[Dominican Republic]**: 'S[an]t[o] Dom[ingo] 55.1; *Hyperythra*? *agasusaria*' (abdomen missing) (BMNH). Holotype ♀ (*bilbisaria*) **[Dominican Republic]**: 'S[an]t[o] Dom[ingo] 55.1; *Caberodes bilbisaria*' (genitalia slide No. 14341) (BMNH).

Cuba: Holguin (Holquin); Santiago. **Dominican Republic:** Santo Domingo (see Remarks). **Costa Rica:** *Guanacaste Province*: Rincon National Park, 4km E Casetilla; Finca Biesnan, 500 m; Casa Oeste, Cerro El Hacha, 12 km SE La Cruz, 300 m; Santa Rosa National Park; Hacienda San Isidro, 6.7 km N Quebrada Grande; W of Carmona Nicoya, 600–700 m. *Alajuela Province*: Estacion Pitilla, 680 m, 8 km S Santa Cecilia. *Heredia Province*: La Selva Biological Station, 40 m, Puerto Viejo de Sarapiqui. *Limon Province*: 9.4 km W Bribri, Suretka, 200 m. **Ecuador:** Puna. **Brazil**: (precise locality not recorded).

Thysanopyga pygaria (Guenée, 1857) **comb. n.**

(Figs 9–11, 119)

Pachydia pygaria Guenée, 1857: 138. Holotype ♂, BRAZIL (BMNH) [examined].

♂ (Figs 9–11). Rather small. Ground colour of wings chocolate to coffee-brown, with extensive orange to sepia markings particularly on basal areas of fore wing and hind wing and distal to the postmedian line on the fore wing. Apical blotch distinct, but not very bright. Median line nearly absent on fore wing, and ill defined on hind wing. Discal spots black on fore wing, white on hind wing, and of varying size. Underside greyish-white dusted with dark grey. Terminal shade fairly broad, light purplish grey. Vestiture of thorax and abdomen concolorous with the brown shade of the wings. Fore wing length: 15–18 mm.

GENITALIA ♂ (Fig. 119). Uncus moderately long, slightly curved. Distal part of valva small, narrow, its inner margin densely hairy; sacculus not much larger than distal part of valva, with a clearly defined area carrying large 'pores'. Tegumen broad. Aedeagus closely resembling that of *T. amarantha*; median cornutus very broad.

GENITALIA ♀. Unknown.

DIAGNOSIS. Externally, this species is likely to be confused only with *T. amarantha* in which there is a considerable overlap in size and markings. However, in *pygaria* the uncus is much shorter than in *amarantha*, the lower and upper part of the valva are narrower, the tegumen is less elliptical, and the vinculum is more heavily sclerotized.

DISTRIBUTION. Only very imperfectly known due to confusion in external features with *T. amarantha*. Confirmed from Argentina, Brazil, and Paraguay, perhaps suggesting a more southerly distribution compared with its congeners.

MATERIAL EXAMINED (6♂).
Holotype ♂, **[Brazil]**: Type; *Pygaria* Gn. Brésil; *Pachydia Pygaria* Guenée (Sp.G. X No 1146)—Boîte 255; Typicum Specimen; Ex Musaeo Ach. Guenée; Abb. 4777 [on illustration apparently cut from a plate]; Ex Oberthür Coll. Brit. Mus. 1927–3 (genitalia slide No. 14343; BMNH)

Brazil: Sao Paulo, Itapura; Misiones. **Paraguay**: Sapucay. **Argentina**: Haut Parana, San Ignacio Missions (BMNH).

Thysanopyga amarantha Debauche, 1937

(Figs 12–19, 120, 154)

Thysanopyga amarantha Debauche, 1937: 20, Fig. 13. Holotype ♂, [BRAZIL]: Manicore, Rio Madeira (*Le Moult*). [Possibly lost; not examined.]

♂ (Figs 12–17), ♀ (Figs 18–19). Very variable

both in size and colour. Ground colour ranging from pale ochreous brown to dark purplish red, but always finely striated; frequently with extensive orange markings in the subbasal and postmedian areas of the fore wing, and also in the basal half of the hind wing. Apical blotch varying from large and conspicuous to nearly invisible. Median line on fore wing mostly weak, postmedian line usually only slightly concave. White discal spot on hind wing often rather large. Underside ochreous with reddish tinge, irrorated with grey; terminal shade reddish. Vestiture of thorax and of a varying number of anterior abdominal segments concolorous with wings, other abdominal segments ochreous-grey. Fore wing length: ♂ 16–20 mm; ♀ 18 mm.

GENITALIA ♂ (Fig. 120). Uncus very long, strongly curved. Distal part of valva broad, densely hairy over most of its surface. Sacculus very large. Tegumen elongated. A small hairy lobe with four to five setae present on inner margin of valva. Vinculum not markedly dilated towards base, its margins only weakly sclerotized. Aedeagus similar to that of *pygaria*, with a broad median cornutus and about 12 apical cornuti, two of which are markedly larger.

GENITALIA ♀ (Fig. 154). Papillae anales short, blunt. Apophyses slender, posteriores slightly longer than anteriores. Sterigma appearing as a darker area, but without structural specializations. Ductus bursae typical of the group. Corpus bursae rounded, slightly elongated, with spinose area consisting of a small group of irregularly shaped and fairly large spines.

DIAGNOSIS. Because of its variability, *T. amarantha* may be confused with several other species, particularly *T. pygaria* and *T. henneickeae*. From *pygaria*, it can be distinguished by its usually larger size, longer uncus and broader valva. From *henneickeae*, it may be separated by its usually smaller size, less fiery colour, longer uncus, and narrower and less sclerotized vinculum. In the female genitalia, the corpus bursae of *henneickeae* is more elongated than that of *amarantha* and devoid of a spinose area.

DISTRIBUTION. *Thysanopyga amarantha* has possibly the widest range of all species of *Thysanopyga*. It has been recorded from Trinidad, Guatemala, Costa Rica, Colombia, Venezuela, French Guiana, Brazil, Peru, and Bolivia.

BIOLOGY. On the Mato Grosso of Brazil, males have been observed to visit damp sand and human perspiration, probably in the daytime.

REMARKS. The holotype has not been traced. However, the description of Debauche, which includes an illustration of the male genitalia, is sufficiently detailed for us to feel confident about the identity of *amarantha*.

MATERIAL EXAMINED (28♂, 2♀).
Trinidad: Caparo; Par. of St.George. **Costa Rica:** *Guanacaste Province*, W.of Carmona Nicoya, 600–700 m; Santa Rosa Nat[ional] P[ar]k; *Puntarenas Province*, Manuel Antonio Nat[ional] P[ar]k, Quepos, 30m; Osa Peninsula, Sirena Corcovado Nat[ional] P[ar]k; *Heredia Province*, La Selva Biol[ogical] Sta[tion], Puerto Viejo de Sarapiqui, 40 m. **Guatemala**: Cayuga. **Colombia**: Muzo, 400–800 m; Bogota. **Venezuela**: San Esteban. **French Guiana**: St.Jean de Maroni. **Brazil**: Rio de Janeiro, Organ Mountains, near Tijuca; Parana, Iguassu; Sao Paulo. **Peru**: Chanchamayo, 2100–7500 f[ee]t; La Union, R[iver] Huacamayo, Carabaya, 2000 f[ee]t, wet season; Yahuarmayo, SE Peru, 1200 f[ee]t. **Bolivia**: Prov. del Sara, Dept. Santa Cruz, 450m (BMNH, INBio).

Thysanopyga henneickeae sp.n.

(Figs 20, 21, 121, 155)

♂ (Fig. 20), ♀ (Fig. 21). Large. Median area of fore wing and hind wing lilac, remaining wing area brown, mixed with more or less extensive orange markings. Wings with brown and grey striations of varying density. Median line on fore wing practically absent. Subbasal and postmedian lines almost straight, leaving a rather narrow median area between them. Apical blotch conspicuous. Hind wing with the white discal spot moderately large, median line not clearly defined, but broad, more like a fascia. Female of same size as male, but paler. Underside with broad, purplish-red terminal shade. Dorsal aspect of thorax orange to reddish-brown, of abdomen brown on anterior half, and grey on posterior half. Fore wing length: ♂ 20–21 mm; ♀ 20 mm.

GENITALIA ♂ (Fig. 121). Elongated. Uncus fairly short, straight. Distal part of valva hairy along the margins, of about the same size as sacculus. Tegumen narrow. Vinculum large, becoming very broad at base, and with two lateral lobes in its upper part. Aedeagus small compared with size of the rest of the genitalia, with a group of about five rather long apical cornuti. Median cornutus short and broad.

GENITALIA ♀ (Fig. 155). Papillae anales short and blunt. Apophyses posteriores narrower and

much longer than anteriores. Ostium and sterigma weakly sclerotized. Ductus bursae typical of the group, long, smooth, and well sclerotized. Corpus bursae elongated, of irregular shape, and without spinose area.

DIAGNOSIS. A very large and vividly coloured species, which may occasionally be confused with certain large specimens of *T. amarantha*. The two species appear to be sympatric only in French Guiana, to which *T. henneickeae* is apparently restricted. The species are readily distinguishable by examination of the genitalia. In the male, the uncus of *henneickeae* is shorter and not curved, the shape of the valva and the distribution of hairs on that structure differs, and the vinculum is broader and more heavily sclerotized. In the female, the corpus bursae of *henneickeae* is much more elongated and lacks the spinose area present in *amarantha*.

DISTRIBUTION. Known only from the type series. All specimens were collected in French Guiana.

REMARKS. MK names this species after his wife Kerstin, née Henneicke, in recognition of much help and inspiration over the past years.

MATERIAL EXAMINED.
Holotype ♂, [**French Guiana**]: (Guyane Française), collection C. Bar; ex Oberthür Coll. Brit. Mus. 1927–3 (genitalia slide No. 13664; BMNH).

Paratypes (5♂, 3♀): 4♂, 3♀, same data as holotype; (genitalia slides No. 13665, 13496, 14355; BMNH). **French Guiana**: 1♂, St. Jean de Maroni, Received from E. LeMoult; Rothschild Bequest B.M. 1939–1 (BMNH).

Thysanopyga gauldi sp.n.

(Figs 22, 23, 122, 156)

♂ (Fig. 22), ♀ (Fig. 23). Large. Ground colour pink and purplish brown, densely dusted with grey. Some specimens with orange markings on the postmedian area of the fore wing. Median area of both wings much paler than other areas, greyish pink. Median line present, but not clearly defined. Subbasal and postmedian lines prominent, the areas between them dark purplish. Apical blotch moderately well developed. Discal spot on fore wing black, on hind wing white, clearly visible. Underside ochreous grey, with broad, purplish-red terminal shade. Vestiture of thorax and anterior abdominal segments dark purple, of remaining segments dark brown: Fore wing length: ♂ 18–19 mm; ♀ 20–21 mm.

GENITALIA ♂ (Fig. 122). Resemble those of *T. pygaria*. Elongated and small compared with the size of the moth, but aedeagus of normal size. Uncus moderately long, curved. Distal part of valva small, triangular, its inner margin densely hairy; sacculus large, with a distal area bearing large 'pores'; proximal part with long hairs. Tegumen rather broad. Aedeagus large, longer than rest of genitalia with several groups of apical cornuti; two of the cornuti very large. Median cornutus elongated.

GENITALIA ♀ (Fig. 156). Papillae anales short and blunt as in preceding species. Both pairs of apophyses slender. Sterigma discernible as an area of denser sclerotisation. Ductus bursae comparatively short. Corpus bursae pear-shaped, with conspicuous longitudinal folds and with spinose area consisting of a band of minute denticles situated centrally.

DIAGNOSIS. Externally similar to *T. apicitruncaria* and *abdominaria*, but nearly always larger and paler, especially the median area of the fore wing. The male genitalia resemble those of neither species; they are much closer to *T. pygaria*. From *henneickeae*, *gauldi* may be separated by the presence of hairs on the sacculus and the much larger aedeagus; also, in *gauldi*, the apical cornuti are arranged in three distinct groups of different sizes, and the median cornutus has a distinct 'knob'.

DISTRIBUTION. Known only from Costa Rica.

REMARKS. This species is named in honour of Dr Ian Gauld, of the Department of Entomology of The Natural History Museum, London, in recognition of his tireless efforts on behalf of Costa Rican ichneumonid taxonomy and the development of collaboration between the National Biodiversity Institute of Costa Rica and The Natural History Museum, London.

MATERIAL EXAMINED.
Holotype ♂, [**Costa Rica**]: La Selva Biol[ogical] Sta[tion], 40 m, Puerto Viejo de Sarapiqui, Heredia Prov[ince], Feb[ruary] 1987 (*Chavarria*) (genitalia slide No. 14322; BMNH).

Paratypes (4♂, 2♀): 2♂, 1♀ same data as holotype (except 1♂ dated July) (genitalia slides No. 14302, 14361; BMNH). **Costa Rica**: 1♂, Fila Esquinas, 35 km S Palmar Norte, Punt[arenas] Prov[ince], 7–8 Jan[uary] 1983, 150 m elev[ation], 8° 45′ × 83° 20′ (*Janzen & Hallwachs*) (genitalia slide No. 14321; BMNH); 1♂, Estacion Carrillo, P[ar]k Nac[ional] Braulio Carrillo, Prov[ince] San José, 700 m, July 1984 (*Chacon*) (genitalia slide No. 14303; BMNH); 1♀, Finca

La Selva (OTS), Puerto Viejo de Sarapiqui, Heredia Prov[ince], 50 m, 14–15 Nov[ember] 1982 (*Janzen & Hallwachs*) (genitalia slide No. 14356; BMNH).

Thysanopyga strigata Warren, 1907

(Figs 24, 25, 123, 157)

Thysanopyga strigata Warren, 1907: 293. Holotype ♂, ARGENTINA (BMNH) [examined].
Thysanopyga strigata Warren; Prout, 1910: 300 [*partim*].

♂ (Fig. 24), ♀ (Fig. 25). Small. Ground colour of fore wing ochreous grey, densely striated with grey. Apical blotch nearly circular, also greyish and therefore inconspicuous. Lines hardly discernible, yellowish-ochre. Postmedian line on fore wing not straight but making a bend below the blotch; postmedian area darker grey. Discal spots small, black on fore wing, white on hind wing. Underside ochreous-grey, with grey irrorations, terminal shade weak. Thorax and abdomen brownish grey. Fore wing length: ♂ 13 mm; ♀ 14 mm.

GENITALIA ♂ (Fig. 123). Uncus long, socii absent. Distal part of valva small, rounded, with a tooth-like projection at the base of its inner margin, hairy over its entire surface; sacculus nearly equalling distal part in size, with an area characterized by larger pores. Juxta shape as in Fig. 123. Tegumen and vinculum very broad, with margins well sclerotized. Aedeagus slender, straight, with numerous apical cornuti and a handle-shaped median cornutus.

GENITALIA ♀ (Fig. 157). Papillae anales stout, blunt. Both pairs of apophyses slender, of about equal length. Sterigma small. Ductus bursae short and stout; corpus bursae almost round, with numerous small denticles covering over one half of its area.

DIAGNOSIS. The general appearance of this species is atypical of the genus, and *strigata* cannot be confused with any other species of *Thysanopyga*. It somewhat resembles *nigricomata* (Warren) (removed to *Perissopteryx*, below). The genitalia, however, show clearly that *T. strigata* belongs to the *T. apicitruncaria*-group.

DISTRIBUTION. The only two specimens examined come from Argentina: Ciudad de Tucuman; and Brazil: Rio de Janeiro.

REMARKS. A female in the BMNH from La Rioja, which was identified as *strigata* by Prout (1910: 300), does not belong to this species. Its identity is uncertain.

MATERIAL EXAMINED (1♂, 1♀).
Holotype ♂, [**Argentina**]: Ciudad de Tucuman, April 1903, (L. Monetti); NZ xiv.293; *Thysanopyga strigata* Warren ♀ [*sic*] Type; Rothschild Bequest B.M. 1939–1 (genitalia slide No. 14338; BMNH).
Brazil: Rio de Janeiro, Organ Mts. near Tijuca, S.R. Wagner 1902–287 (genitalia slide No. 13579; BMNH).

Thysanopyga prunicolor Warren, 1908

(Figs 26, 158)

Thysanopyga prunicolor Warren, 1908: 109. Holotype ♀, [BRAZIL] (NMNH) [examined].

♀ (Fig. 26). Small. Wings dark grey brown, with darker dusting. Lines brown, hardly visible, the median line best developed. Discal spots white with pupil black on fore wing, white on hind wing. Apical blotch fairly distinct. Ochreous streak running along costa of fore wing. Underside purplish-ochreous, heavily irrorated with grey. Terminal shade darker, but not well defined. Discal spots not visible. Vestiture of thorax and abdomen concolorous with wings. Fore wing length: 14 mm.

GENITALIA ♂. Unknown.

GENITALIA ♀ (Fig. 158). Papillae anales narrow, pointed. Apophyses slender, both pairs of about equal length. Sterigma with both lamellae distinct. Ductus bursae narrow, moderately sclerotized. Corpus bursae of irregular shape, broadly elongated, its wall tough. Spinose area covering most of one side of corpus bursae, consisting of numerous small denticles.

DIAGNOSIS. *T. prunicolor* and *strigata* are the smallest species of *Thysanopyga*. The lines on the wings of *strigata* are indistinct, but the apical blotch is clear.

DISTRIBUTION. Brazil.

MATERIAL EXAMINED (3♀).
Holotype ♀, [**Brazil**]: Rio [de] Janeiro; *Thysanopyga prunicolor* ♀ type; Type No. 11408 U.S.N.M. (NMNH).
Paratype. 1♀, data as holotype.
Other material. **Brazil:** Rio [de Janeiro] (BMNH).

The *carfinia*-group

Thysanopyga carfinia (Druce, 1893) comb.n.

(Figs 27–29, 124, 159)

Pachydia carfinia Druce, 1893: 136, pl. 53, Figs 25, 26. LECTOTYPE ♂, [GUATEMALA] (BMNH), here designated [examined].

♂ (Figs 27, 28), ♀ (Fig. 29). On average size, this species is the smallest of the *carfinia*-group. Ground colour of wings brownish pink, sometimes with a tinge of olive, irrorated with dark scales. Basal area of fore wing flesh-coloured. Costal margin with a broad blackish streak. Apical blotch prominent. Median lines on fore wing and hind wing present, but weakly developed. Discal spots on fore wing black, on hind wing white. Underside greyish-brown with broad, dark terminal shade; discal spots clearly visible to nearly absent. Fore wing length: ♂ 15–18 mm; ♀ 18–19 mm.

GENITALIA ♂ (Fig. 124). Uncus relatively broad, terminating in a fine hook, socii large. Distal part of valva broadly rectangular, hairy over its entire surface; sacculus small, its outer margin also hairy. Tegumen very compact, nearly rectangular; upper ventrolateral process angulated and pointing upwards; lower process broad. Aedeagus small and slender compared with rest of genitalia, with cornuti as shown in Fig. 124.

GENITALIA ♀ (Fig. 159). Apophyses slender, posteriores hardly longer than anteriores. Sterigma with characteristic sclerotizations (see Fig. 159). Anterior part of ductus bursae long and heavily sclerotized, posterior part moderately long. Corpus bursae rounded, with a large spinose area covering the apical third.

DIAGNOSIS. *Thysanopyga carfinia* and the three following species are very closely related. This species is best identified in the female by the shape of the sterigma (see Fig. 159), together with the posterior part of the ductus, which is very short and stout in *T. janzeni*, moderately long in *carfinia* and *nigricosta*, and very long in *olivescens*. The males are best distinguished by the shape of the inner projections of the tegumen (Fig. 124). *T. carfinia* and *T. olivescens* are restricted to Central America, while *nigricosta* and *janzeni* occur only on the South American mainland.

LARVA. A specimen (identified by W. Lybarger from the adult male moth that was subsequently reared) was collected by J.E. Rawlins (pers. comm.) in Yaxoquintela (Chiapas, Mexico) from *Gouania polygama* (Jacq.) Urban (Rhamnaceae). *G. polygama* is common from Arizona to Brazil, and throughout the Caribbean (J.E. Rawlins pers. comm.). The larva pupated on 24.x.1978, and the adult eclosed on 7.xi.1978.

DISTRIBUTION. Central America from Panama to Mexico. Recorded from the following countries: Mexico, Guatemala, Costa Rica, and Panama.

MATERIAL EXAMINED (34♂, 7♀).
Lectotype ♂, **[Guatemala]**: Panima, Champion; Godman-Salvin Coll. 1903–4, B.C.A. Lep[idoptera] Het[erocera] *Pachydia carfinia* Druce; *Pachydia carfinia* Druce ♂ Type [handwritten]; (genitalia slide No. 13658; BMNH).

Paralectotypes: **Guatemala:** 1♀, Volcan de Atitlan, 2500–3000 feet, Champion; Godman-Salvin Coll. 1903–4, B.C.A. Lep.Het. *Pachydia carfinia* Druce; *Pachydia carfinia* Druce ♀ Type [handwritten]; (genitalia slide No. 13657; BMNH) [examined]; 1♀, Volcan de Atitlan, 2500–3000 feet, Champion; *Pachydia carfinia* Druce [handwritten]; Joicey Bequest. Brit. Mus. 1934–120; 1♂, as before but without the handwritten label; 1♂, Pantaleon, 1700 feet, Champion, Godman-Salvin Coll. 1903–4, B.C.A. Lep. Het. *Pachydia carfinia* Druce; 1♂, Las Mercedes, 3000 feet, Champion, Godman-Salvin Coll. 1903–4 B.C.A. Lep. Het. *Pachydia carfinia* Druce; 1♂, El Tumbador, 2500 feet, Champion, Godman-Salvin Coll. 1903–4. B.C.A. Lep. Het. *Pachydia carfinia* Druce. **Mexico**: 1♀, Presidio, Forrer; Godman-Salvin Coll. 1903–4, B.C.A. Lep. Het. *Pachydia carfinia* Druce. **Panama**: 1♀, Volcan de Chiriqui, 2000–3000 feet, Champion, Godman-Salvin Coll. 1903–4, B.C.A. Lep. Het. *Pachydia carfinia* Druce (BMNH).

Other material. **Mexico**: Chiapas, Yaxoquintela, 16–58N, 91–47W, 560 m., J.E. Rawlins (larva, see above). **Costa Rica**: Guanacaste Province: 4 km E Casetilla, Rincon National Park, 750m; Finca Biesnan, Colonia Refug. Los Angeles, 1 km E Quebrada Grande, 500 m; Santa Rosa National Park; Heredia Province: Finca La Selva, Puerto Viejo de Sarapiqui, 40 m; Estacion El Ceibo, Braulio Carrillo Nat. Pk., 400–600 m; San José Province: Estacion Carrillo, Parc Nacional Braulio Carrillo, 700 m; Estacion Bijagual, 500 m, Res. Biol. Carara; Alajuela Province: Estacion Pitilla, 9 km S Santa Cecilia, 700 m; Finca San Gabriel, 16 km E Quebrada Grande,

630 m; Puntarenas Province: Osa Peninsula, Sirena, Corcovado National Park; Finca Cafrosa, Estacion Las Melizas, P.N. Amistad., 1300 m (INBio).

Thysanopyga nigricosta Warren, 1905

(Figs 30–32, 125, 160)

Thysanopyga nigricosta Warren, 1905: 61. LECTOTYPE ♂, [PERU] (BMNH), here designated [examined].

♂ (Figs 30, 31), ♀ (Fig. 32). Moderately large to large, ground colour varying between fawn and brown, usually with a tinge of olive, especially in postmedian area of wings. Most specimens with pale orange markings in basal region of fore wing and hind wing, and to the exterior of the postmedian line on the fore wing. Along the costa runs a blackish streak. Apical blotch prominent. Female larger than male, but of same colour. Underside ochreous, dusted with grey; terminal shade brown. Vestiture of thorax and abdomen orange-brown to brown. Fore wing length: ♂ 17–20 mm; ♀ 20 mm.

GENITALIA ♂ (Fig. 125). Uncus very large, socii large. Tegumen with two pairs of inner projections; upper pair acutely pointed and directing upwards, lower pair rounded and horizontal to slightly downward-pointing. Juxta shield-shaped. Aedeagus slender, with cornuti as shown in Fig. 125.

GENITALIA ♀ (Fig. 160). Apophyses slender, posteriores nearly twice the length of anteriores. Sterigma very large, with three lobes. Anterior part of ductus bursae large and heavily sclerotized, posterior part moderately long. Corpus bursae rounded, with a large spinose area covering posterior apical third.

DIAGNOSIS. May be confused, in external features, with *T. janzeni*. Although adults of *nigricosta* are usually darker, especially along the termen of the fore wing and the hind wing, examination of the genitalia is usually necessary for identification. Also similar to *T. carfinia*, but that species is usually smaller and more heavily suffused with grey. In the male genitalia, *nigricosta* is best distinguished by the shape of the inner projections of the tegumen; in the female genitalia, the large, 3-lobed sterigma is the most useful character. *T. carfinia* and *T. nigricosta* are allopatric, the former being restricted to Central America, and the latter to the South American mainland.

DISTRIBUTION. Collected from Peru and Bolivia.

REMARKS. The original description was said to be based on 'several examples from Santo Domingo, Carabaya, S.E.Peru (Ockenden)' (Warren 1905: 61). However, apart from the lectotype, no further specimens of the type series have been traced.

MATERIAL EXAMINED (7♂, 1♀).
Lectotype ♂, [**Peru**]: Santo Domingo, Carabaya (genitalia slide No. 13659; BMNH).

Peru: La Union, R[io] Huacamayo, Carabaya, 2000 f[ee]t; Chanchamayo; Yahuarmayo, 12000 f[ee]t; Santo Domingo, Carabaya. **Bolivia**: Salampioni, 800 m (BMNH).

Thysanopyga olivescens sp.n.

(Figs 33, 34, 126, 161)

♂ (Fig. 33), ♀ (Fig. 34). Rather small and dark. Ground colour brownish-olive at base and margins of fore wing and hind wing, and of a greyish fawn colour on median area of fore wing and most of hind wing. Both wings densely suffused with dark scales. Lines and markings on upper surface and under surface as in *carfinia* and *nigricosta*. Fore wing length: ♂ 16–17 mm, ♀ 17–18 mm.

GENITALIA ♂ (Fig. 126). Uncus very large; socii large. Tegumen with only lower inner projections, which are extremely long and point upwards; upper projections absent and replaced by a serrated section. Juxta rather large, shield-shaped. Vinculum more elongated than in other species of the group. Aedeagus slightly more robust than in the other species, with a large apical cornutus and a number of much smaller, subapical cornuti.

GENITALIA ♀ (Fig. 161). Both pairs of apophyses slender, posteriores markedly longer than anteriores. Sterigma rather small. Anterior part of ductus bursae even stouter than in other species of the group, but posterior part much longer. Corpus bursae rounded, with a large spinose area covering the apical third.

DIAGNOSIS. Although most specimens of *olivescens* are clearly recognizable by their sombre colour, pale examples may be confused with *T. carfinia*. Both species are Central American in distribution. In such doubtful cases, examination of the genitalia is necessary for identification. In the male genitalia, *olivescens* may at once be recognized by the very long, lower inner projection of the tegumen; in the female genitalia, the

posterior part of the ductus bursae is much longer than in the other species of the *carfinia*-group.

DISTRIBUTION. *T. olivescens* has been collected only from Costa Rica.

REMARKS. The name of this species is based on the characteristic olivaceous ground colour.

MATERIAL EXAMINED (5♂, 9♀).
Holotype ♂, [**Costa Rica**]: Santa Rosa Nat[ional] P[ar]k, Prov[ince] Guanacaste, 16–18 Nov[ember] 1979 (*Janzen*) (genitalia slide No. 13649; BMNH).

Paratypes. **Costa Rica**: Guanacaste Prov[ince], 1♂, data as holotype (undated), 7♀, 7 Jan 1979; 2–11 March 1980 (genitalia slide No. 14730; BMNH); 25 Dec 1978; 28 Dec 1978; 29 Dec 1978; 31 Dec 1978; 15–17 May 1979. 2♀, W of Carmona Nicoya, 600–700 m, 19 Aug[ust] 1982 (*Janzen & Hallwachs*) (genitalia slide No. 13650; BMNH); 1♂, Heredia Prov[ince], La Selva Biol[ogical] Sta[tion], 40 m, Puerto Viejo de Sarapiqui, May 1987, (*Chavarria*); 1♂, G[uanaca]ste Prov[ince], 4 km E Casetilla, Rincon Nat[ional] P[ar]k, 14 Feb[ruary] 1983, (*Janzen & Hallwachs*); 1♂, Prov[ince] San José, Estacion Carrillo, P[ar]c Nac[ional] Braulio Carrillo, 700 m, Nov[ember] 1984 (*Chacon*).

Thysanopyga janzeni sp.n.

(Figs 35–37, 127, 162)

♂ (Figs 35, 36), ♀ (Fig. 37). Virtually indistinguishable from pale specimens of *T. nigricosta*, see description given for that species (above). Fore wing length: ♂ 16–20 mm; ♀ 18–21 mm.

GENITALIA ♂ (Fig. 127). Uncus very large; socii large. Distal part of valva broadly rectangular, hairy over its entire surface; sacculus rather small, also hairy. Upper inner projections of tegumen blunt and lobe-like, lower inner projections slender, rounded, and pointing upwards. Aedeagus slender, closely resembling that of *nigricosta*.

GENITALIA ♀ (Fig. 162). Both pairs of apophyses slender, posteriores nearly twice the length of anteriores. Sterigma wrinkled, bearing numerous folds. Ductus bursae short and stout anteriorly, as in other species of the group, posterior part very short. Corpus bursae rounded, with a large spinose area covering the apical third.

DIAGNOSIS. Although adults are mostly paler than in *nigricosta*, especially in the postmedian areas of the wings, no reliable external characters can be given to separate these species from *T. nigricosta*. However, in the male genitalia, *janzeni* is characterized by the large blunt lobe formed by the upper inner projections of the tegumen. In the female genitalia, the strongly folded nature of the sterigma, together with the very short posterior part of the ductus bursae enable the recognition of *janzeni*.

DISTRIBUTION. Apparently fairly widespread in South America (Colombia, Ecuador, Brazil), but not extending into Central America, where the *carfinia*-group is represented by *T. carfinia* and *olivescens*.

REMARKS. This new species is named in honour of Professor Daniel H. Janzen, in recognition of his immense contribution to conservation in Costa Rica.

MATERIAL EXAMINED (5♂, 2♀).
Holotype ♂, [**Colombia**]: Muzo, R[io] Cantinero, 400 m, (*Fassl*); Rothschild Bequest, B.M. 1939–1 (genitalia slide No. 14295; BMNH).

Paratypes. **Colombia**: 1♀, Muzo, 400–800 m, coll. Fassl; L.B. Prout coll. B.M. 1939–643; *Thysanopyga carfinia* Druce ♀ [not decipherable] det.; (genitalia slide No. 13513; BMNH); 1♂ Muzo, R[io] Cantinero, 400m, (*Fassl*); Rothschild Bequest B.M. 1939–1 (genitalia slide No. 14333; BMNH). **Brazil**: 2♂, S.E. Brazil, Sao Paulo; E.D. Jones Coll. Brit. Mus. 1919–295; *Pachydia carfinia* Druce [handwritten] [misidentification] (genitalia slide No. 14337; BMNH). **Ecuador**: 1♂, Balzapamba, Prov[incia] de Bolivar, (*de Mathan*), iii–iv 1894; Ex Oberthür Coll. Brit. Mus. 1927–3 (genitalia slide No. 14334; BMNH); 1♀, N.W., Bulim, 160 f[ee]t, I [19]01 (*Fl.& Mik.*); Rothschild Bequest B.M. 1939–1 (genitalia slide No. 14336; BMNH).

PERISSOPTERYX Warren, 1897

Perissopteryx Warren, 1897: 477. Type species: *Perissopteryx delusa* Warren, 1897: 477, by original designation.

Generally, species of *Perissopteryx* are less brightly coloured than in *Thysanopyga*. They entirely lack red, orange, and pink in their markings, and are restricted to various shades of ochre, brown, and grey. Also, they are smaller; only a few species have a fore wing length reaching 18 mm, and in most this length ranges between 14 and 16 mm.

The males of the *delusa*-group are readily recognized by the presence of a large flap on the

anal margin of the hind wing, which is folded over on the underside. On the inside, the fold is densely covered with hair-scales, giving it a woolly appearance. In these species, the fore wing is also very broad compared with the size of the hind wing (hence the generic name, from the Greek *perissos*—disproportionally large, and *pteron*—a wing). The flap is absent from females, which are also less robust.

Apart from the *delusa*-group, the monophyly of which is also supported by characters other than of the genitalia, the morphology of the male genitalia suggests the existence of further groupings, possibly monophyletic, among the other species of the genus. However, a more detailed examination is needed to establish that these groups are monophyletic.

The placement of five species (*commendata*, *deprivata*, *distincta*, *nigricomata*, and *albopunctaria*), all of which were previously included in *Thysanopyga*, must be regarded as not fully satisfactory. They differ from the other species of *Perissopteryx* in wing markings, which are pure grey and brown rather than ochreous or grey with dense irrorations, and their lines are finer and narrower. Most also have a subdorsal kink in the postmedian line, a feature not occurring in the other species. In addition, they possess genital coremata arising from the membranous inner parts of the vinculum, reminiscent of the coremata in *Thysanopyga*, while the abdominal coremata, so characteristic of many species of *Perissopteryx*, are absent. The genitalia also differ from those of their congeners. While the vinculum may also be somewhat lyre-shaped (as in Fig. 147) it is never cleft as in *Thysanopyga*, and the saccus is in the form of a sclerotized plate (as in Fig. 148) not a tip as in other *Perissopteryx* species.

These five species share characters with both *Thysanopyga* and the type species of *Perissopteryx*, but, lacking one or more autapomorphies, they cannot be assigned to a genus of their own. On balance, these species are assigned to *Perissopteryx*, particularly because the shape of the valva, including the absence of the sacculus, resembles other members of that genus. However, the assignation is not entirely secure.

VENATION (Figs 109, 110). Vein Sc anastomosing with R1 for a short distance in the fore wing. In the *delusa*-group, vein 2A well developed in hind wing and reaching termen; in other species, vestigial and not reaching termen.

LEGS (Figs 4, 5). Hind tibia with hair pencil present or absent.

ABDOMEN. One or two pairs of pregenital coremata present as ventrolateral pouches in many species. In the *delusa*-group, pregenital coremata are situated between segments A4 and A5, in other species between segments A7 and A8.

GENITALIA ♂. *Perissopteryx* may be distinguished from *Thysanopyga* by several characters. Valva rounded or pointed, never angular or triangular; sacculus absent. Juxta not crescent-shaped, but shape varying widely. Vinculum rarely somewhat lyre-shaped (e.g. Figs 147, 149), but, if so, then unlike condition in *Thysanopyga*, never cleft apically and thus not extended into two processes; saccus either in form of a sclerotized plate, or ending in a more or less prominent tip in which case the vinculum may be rounded (e.g. Fig. 140) or angular (e.g. Figs. 142, 145). Genital coremata occurring in some species, but of a different type from those observed in *Thysanopyga*, and taking the form of broad sacs rather than narrow tubes (except in *P. commendata* where they are similar to those found in *Thysanopyga*). Most *Perissopteryx* species lacking genital coremata, possessing instead a thick hair-pencil on base of valva.

GENITALIA ♀. Shape and size of ductus bursae and corpus bursae varies widely; appendix bursae present in three species (*P. commendata*, *ochrilinea*, *griseobarbipes*). Sterigma either not discernible or with lamellae developed as simple, more or less elliptical sclerites. Texture of wall of bursa copulatrix ranging from tough and leathery to delicate and membranous, sometimes with localized sclerotizations. Signum always absent.

Key to species of *Perissopteryx*

1 Hind wing of males with a large flap on anal margin, folded over on underside (Figs 111–113). Female genitalia of *P. delusa* as in Fig. 163, females of other species unknown (*delusa*-group) 2

— Hind wing of males without such a flap. Female genitalia not as in Fig. 163 4

2 (1) Uncus short, not curved to form a large hook (Fig. 130). Termen of hind wing forming angle; postmedian area of hind wing distinctly paler than ground colour. Female unknown. Peru ..... **huanucoi** (p. 101)

— Uncus much longer, curved to form a large hook (Figs 128, 129). Termen of hind wing rounded, postmedian area of hind wing not lighter than ground colour. Female either unknown (*fletcheri*) or similar to male, but smaller. Not recorded from Peru 3

3 (2) Valva with broad costal arm, aedeagus longer

than in following species (Fig. 129). Female unknown. Venezuela and Colombia ..... **fletcheri** (p. 100)

— Valva lacking costal arm, aedeagus shorter than in preceding species (Fig. 128). Female similar in wing pattern and colour to male, less robust; genitalia with long and broad ductus bursae (Fig. 163). Widespread in Costa Rica, also recorded from Colombia and Mexico ..... **delusa** (p. 100)

4 (1) Vinculum always longer than tegumen, usually markedly so, its base rounded and usually with a more or less prominent sclerotized plate (Figs 148–150), or, rarely, drawn into a relatively weak tip (Fig. 151). Genital coremata frequently present. Female genitalia, where known, either elongated and with transition between ductus and corpus bursae gradual, with an appendix bursae (Fig. 178), or with a small and rounded corpus with an appendix bursae (Fig. 177) 20

— Vinculum of varying length, but always drawn into a robust, although sometimes short, tip (e.g. Figs 132, 133). Genital coremata absent. Female genitalia very variable, but not as in Figs 177, 178 5

5 (4) Hind tibia of males with conspicuous hair pencils. Male genitalia (Figs 131, 132) with short tegumen and short, rather narrow valva. Female genitalia either with spindle-shaped corpus and appendix bursae (Fig. 164), or with very long, coiled ductus bursae (Fig. 165) 6

— Hind tibia of males without such hair pencils. Male genitalia not as in Figs 131, 132; female genitalia not as in Figs 164, 165 7

6 (5) Adults nearly uniformly ochreous to dark chocolate brown, with only light grey scaling. Apical blotch on fore wing prominent, also on underside. Male genitalia (Fig. 132): uncus with a small subapical hook, aedeagus long and narrow, not flask-shaped. Female genitalia (Fig. 165): ductus bursae uniquely long and coiled, corpus bursae rounded, without appendix ..... **ochreobarbipes** (p. 102)

— Adults grey-brown or olive-ochre, with intense grey scaling. Apical blotch on fore wing weakly developed, nearly absent on underside. Male genitalia (Fig. 131): uncus lacking subapical hook; aedeagus short and flask-shaped. Female genitalia (Fig. 164): ductus bursae short and stout, corpus bursae spindle-shaped, with large appendix bursae ..... **griseobarbipes** (p. 101)

7 (5) Valva short, apex well rounded or, if pointed, free part of vinculum very short (Figs 135, 136). Female genitalia with long, entirely or partly sclerotized ductus bursae and elongated corpus bursae (Figs 168, 169). Relatively pure ochreous species with little grey dusting. Apical blotch very clear on both sides 8

— Valva moderately long to long, pointed. Female genitalia variable, but if with long ductus bursae and elongated corpus, then sclerotizations and/or sterigmata different. Rather variable, brown-grey or olive-ochreous species. Apical blotch less clear 9

8 (7) Smaller species. Male genitalia: valva pointed, but appearing rounded due to density of marginal hair covering; tegumen roughly triangular, vinculum very short below base of valva (Fig. 136). Female genitalia (Fig. 169) with circular sterigma and very long and slender corpus bursae; entire ductus bursae sclerotized. Widespread (Brazil, Peru, French Guiana, Guatemala) ..... **submarginatella** (p.105)

— Larger species. Male genitalia: valva rounded; tegumen not triangular; free part of vinculum longer (Fig. 135). Female genitalia as in Fig. 168; only one side of ductus bursae sclerotized. An additional sclerotization present on corpus bursae. Costa Rica ..... **submarginata** (p. 104)

9 (7) Aedeagus with characteristic 'angulated' median cornutus (Figs 133, 134, 142–146). Female genitalia either with moderately long and stout ductus and elongated, pear-shaped corpus bursae (Figs 166, 167, 175) or with very long ductus and smaller, more rounded corpus bursae (Figs 173, 174, 176) 10

— Aedeagus either with a single, long, needle-like cornutus (Figs 139, 140, 141) or with a single, broadly flask-shaped cornutus (Figs 137, 138). Females of two species of the first category unknown, genitalia of the third species typically pipe-shaped (Fig. 172); genitalia of females of the second category with long and narrow ductus bursae and either large and nearly rectangular (Fig. 171) or pear-shaped corpus bursae with a small lateral appendix (Fig. 170) 16

10 (9) Valva long. Lateral arms of vinculum well rounded to nearly semicircular, base of vinculum rounded, saccus small (Figs 133, 144). Female genitalia with long, stout ductus bursae and elongated corpus bursae (Figs 166, 167). Small species with rather narrow fore wings; fore wing length not exceeding 15 mm 11

— Valva variously shaped, but never quite as long. Lateral arms of vinculum narrower, base of vinculum angulated, saccus larger (e.g. Figs 142, 143). Female genitalia not as in Figs 166, 167, and either with a very long ductus and small and rounded corpus bursae (Figs 173, 174, 176) or corpus broader than long (Fig. 175). Usually larger species, mostly with broader fore wings 12

11 (10) Male genitalia: juxta entire, as in Fig. 134. Pointed process of median cornutus not longer than other process. Female genitalia (assuming correct identity) (Fig. 167) with twisted ductus, joining corpus bursae apically ..... **neougaldei** (p. 104)

— Male genitalia: juxta as in Fig. 133, lower part cleft. Pointed process of median cornutus distinctly longer than other process. Female genitalia (Fig. 166) with ductus not twisted, appearing to join corpus bursae subapically ..... **ugaldei** (p. 103)

12 (10) Vinculum nearly twice as long as tegumen and aedeagus with an additional row of minute cornuti at apex (Fig. 146). Female unknown ..... **muzonensis** (p. 112)

— Vinculum hardly longer than tegumen or, if of similar length, aedeagus without the additional row of minute cornuti (Figs 142–145). Female genitalia either with long to very long ductus and small and rounded corpus bursae (Figs 174, 176), or with long ductus but a large corpus, which is broader than long (Figs 173, 175) 13

13 (12) Vinculum markedly longer than tegumen (Figs 142, 144). Female genitalia as in Figs 173, 175, with a long ductus bursae and short but broad corpus bursae 14

— Vinculum hardly longer than tegumen (Figs 142, 144). Female genitalia as in Figs 173, 175, with a very long ductus bursae and a small and rounded corpus bursae 15

14 (13) Aedeagus shorter, with two groups of apical cornuti, median cornutus robust (Fig. 144). Female genitalia with broadly elongated corpus bursae (Fig. 175). A medium-sized species, fore wing length 16 mm ..... **bozae** (p. 111)

— Aedeagus longer, with one group of apical cornuti, median cornutus slender (Fig. 142). Female genitalia with rather rounded corpus bursae (Fig. 173). A robust species, fore wing length up to 18 mm ..... **smithi** (p. 109)

15 (13) Strong setae present on inner margin of valva (Fig. 143). Abdomen of male with two pairs of coremata. Female genitalia: sterigma as in Fig. 174; ductus bursae very long, twisted, with longitudinal lines. Widely distributed in mainland South America ..... **divisaria** (p. 110)

— Setae absent from inner margin of valva (Fig. 145). Abdomen of male without coremata. Female genitalia: sterigma as in Fig. 176; ductus bursae of similar length, not twisted, without longitudinal lines. Restricted to Trinidad ..... **trinidadicola** (p. 112)

16 (9) Valva long. Aedeagus long, with a single, long, needle-like cornutus (Figs 139, 140, 141) and serrations at tip of vesica. Female of two species unknown, genitalia of the third with bursa typically pipe-shaped (Fig. 172) 17

— Valva shorter. Aedeagus short, with a single, broadly flask-shaped cornutus (Figs 137, 138) and without serrations at tip of vesica. Female genitalia not pipe-shaped, but with long and narrow ductus bursae and either a large, nearly rectangular (Fig. 171) or a smaller, pear-shaped corpus with a lateral appendix (Fig. 170) 19

17 (16) Juxta broadly pointed, with lateral projections. Cornutus about half as long as vesica (Fig. 141). Female unknown. Ecuador ..... **intermedia** (p. 109)

— Juxta roughly rectangular, without lateral projections. Cornutus either one-third the length of or nearly as long as, vesica (Figs 139, 140). Female unknown or genitalia as in Fig. 172. Not recorded from Ecuador 18

18 (17) Cornutus almost as long as aedeagus. Vesica with weak apical serrations (Fig. 139). Female genitalia (Fig. 172) with distinctive pipe-shaped bursa copulatrix. Costa Rica ..... **raveni** (p. 108)

— Cornutus about one-third the length of aedeagus. Vesica with stronger apical serrations (Fig. 140). Female unknown. Peru and Bolivia ..... **suffecta** (p. 108)

19 (16) Male genitalia broad and compact, especially the valva. Uncus straight, not dilated apically. Cornutus nearly as long as aedeagus (Fig. 137). Female genitalia with an elongated corpus bursae and a small lateral appendix bursae (Fig. 170) ..... **ochrilinea** (p. 106)

— Male genitalia relatively more elongated, the valva more acutely pointed. Uncus curved, dilated apically. Cornutus smaller (Fig. 138). Female genitalia with corpus bursae almost rectangular, appearing very large compared with the narrow ductus (Fig. 171) ..... **gamezi** (p. 107)

20 (4) Adults with characteristic dark brown markings (Figs 90, 91). Males with a large hair-tuft on dorsum of fore wing. Male genitalia (Fig. 147) very elongated, with long coremata from base of vinculum. Female genitalia (Fig. 177) with anterior part of ductus and adjoining areas of corpus bursae strongly sclerotized. Appendix bursae present on small, rounded corpus bursae ..... **commendata** (p. 113)

— Adults without dark brown markings. Males lacking such a hair-tuft. Male genitalia (Figs 148–151) less elongated, with coremata in form of sacs rather than long tubes, or absent. Female genitalia, where known, elongated, with a gradual transition between ductus and corpus bursae (Fig. 178) .. 21

21 (20) Discal spot on fore wing white. Male genitalia (Fig. 151) with saccus attenuated, not forming a sclerotized plate. Female unknown ..... **albopunctaria** (p. 115)

— Discal spot on fore wing black. Male genitalia (Figs 148–150) with saccus forming a sclerotized plate 22

22 (21) Small species (fore wing length 14 mm). Male genitalia (Fig. 148) with characteristic basal plate of vinculum and aedeagus with a single cornutus.

Female unknown ..... **deprivata** (p. 113)

— Mostly larger species (fore wing length 15–17 mm). Male genitalia (Figs 149, 150) not modified in this way. Female of one species unknown, genitalia of other species as in Fig. 178 23

23 (22) Male genitalia with vinculum and basal plate well rounded (Fig. 149). Aedeagus with a single median cornutus. Female unknown. Peru ..... **distincta**(p. 114)

— Male genitalia with vinculum and basal plate narrower (Fig. 150). Aedeagus with median cornutus preceded by a group of tiny cornuti. Female genitalia (Fig. 178) strongly elongated; transition between ductus and corpus bursae gradual. Central and South America ..... **nigricomata** (p. 114)

The *delusa*-group

The following three species (*delusa*, *fletcheri*, and *huanucoi*) form what is probably a monophyletic group. Its monophyly is based on the presence of a flap, folded over on the underside, on the hind wing of the males, the pregenital position of the coremata on the abdomen, and the high degree of similarity in the male genitalia.

Perissopteryx delusa Warren, 1897

(Figs 38–41, 128, 163)

Perissopteryx delusa Warren, 1897: 477. Holotype ♂, [COSTA RICA] (BMNH) [examined].

♂ (Figs 38, 39), ♀ (Figs 40, 41). Large and robust, especially the male. Wings almost uniformly brown, irrorated with grey; a rather narrow, irregular, rich chocolate-brown fascia occurring between postmedian and termen. Males more variable in ground colour than females. Costa of fore wing strongly convex. All lines present but not very conspicuous. Apical blotch rather dark except for its inner margin. White discal spot on hind wing large. Fore wing of males very broad compared with hind wing. Flap on underside of hind wing of males as in Fig. 15. Abdomen with conspicuous coremata on segments A4–A5, surrounded by externally visible hair pencils. Fore wing length: ♂ 17–19 mm; ♀ 15–18 mm.

GENITALIA ♂ (Fig. 128). Uncus long, curved to form a hook, with short apical hairs; socii rather small. Valva broad, pointed apically, but without modifications. Juxta a broad band. Two elliptical areas with hair-pencils situated below juxta. Tegumen and vinculum of equal length. Vinculum broad, U-shaped, with well-defined tip. Aedeagus with apical and median cornutus large and curved.

GENITALIA ♀ (Fig. 163). Papillae anales small, narrow. Apophyses moderately slender, posteriores over twice as long as anteriores. Bursa copulatrix: ductus bursae of moderate length, narrow near ostium, then widening towards the broadly elongated corpus bursae. Wall of corpus bursae of the same wrinkled texture as ductus.

DIAGNOSIS. Males resemble those of *P. fletcheri*. *P. delusa* appears to be much more common and to be the only species of the *delusa*-group extending northwards into Central America. In the male genitalia, *delusa* may be distinguished from *fletcheri* by the absence of a costal arm, the pointed valva, and the large and curved apical cornutus. To distinguish *delusa* from *huanucoi*, the best characters are, in *delusa*, the longer uncus, pointed valva and larger apical cornutus. The females of the other two species of the *delusa*-group are unknown. Because of the absence of a distinct sterigma and the shape and tough structure of the bursa copulatrix, *delusa* is unlikely to be confused with females of the other *Perissopteryx* species. However, some (e.g. *smithi* and *raveni*) may be externally similar.

DISTRIBUTION. *Perissopteryx delusa* is widely distributed in Costa Rica, and has been recorded from Colombia and Mexico.

MATERIAL EXAMINED (31♂, 10♀).
Holotype ♂, **[Costa Rica]**: *Perissopteryx delusa* Warren ♂ Type; Holotype; Rothschild Bequest BM 1939–1; (*Underwood*) (genitalia slide No. 13663; BMNH).

Mexico: Misantia; Jalapa. **Costa Rica**: Guanacaste Province: Rincon Nat[ional] P[ar]k; 4 km E Casetilla, Rincon Nat[ional] P[ar]k, 750 m; San José Province: Estacion Carrillo, Braulio Carrillo P[ar]c Nat[ional], 700m; Puntarenas Province: Monte Verde, 1400 m; Las Nubes, 11 km NW Monte Verde; Cartago Province: Moravia de Chirripo, 1000 m; Alajuela Province: Forest Reserve de San Ramon, 5 km N Col. Palmarena, 900 m. Cariblanco; Cashi, 3200 f[ee]t; Orosi; Pozo Azul; Sitio; San José de Costa Rica. **Colombia**: Pueblo Rico, San Juan, Choco Slopes of Colombia, 5200 f[ee]t (BMNH, INBio).

Perissopteryx fletcheri **sp.n.**

(Figs 42, 129)

♂ (Fig. 42). Externally, the new species is indistinguishable from pale specimens of *P. delusa*, although perhaps less robust. For a description,

see under that species. Flap on underside of hind wing of male as in Fig. 112. Coremata as in *delusa*. Fore wing length: 17–18 mm.

GENITALIA ♂ (Fig. 129). Uncus long and curved, socii small. Valva broad and well rounded apically, with a prominent costal arm. Juxta a sclerotized band. Hair-pencils present below juxta. Tegumen and vinculum of about equal length. Vinculum narrows gradually into tip. Aedeagus with both cornuti rather straight.

GENITALIA ♀. Unknown.

DIAGNOSIS. This species is very similar to *P. delusa*, although perhaps slightly less robust. *P. fletcheri* may be distinguished from *P. delusa* by its conspicuous costal arm of the valva, the rounded apex of the valva and the differences in the shape of the cornuti (compare Figs 128 and 129).

DISTRIBUTION. Collected from Caracas (Venezuela) and the upper Rio Negro region of Eastern Colombia.

REMARKS. This species is named after Mr Steven Fletcher in recognition of his dedicated work on the geometrid collection of the BMNH, which has contributed so much to this study and to many other studies on the family.

MATERIAL EXAMINED (1♂, 1♀).
Holotype ♂, [**Colombia**]: Ost Colombia, Ob[erer] Rio Negro, 800 m, Coll. Fassl; Joicey Bequest Brit. Mus. 1934–120 (genitalia slide No. 14331; BMNH).

Paratype. **Venezuela**: 1♀, Caracas; Joicey Bequest Brit. Mus. 1934–120 (genitalia slide No. 13444; BMNH).

Perissopteryx huanucoi sp.n.

(Figs 43, 113, 130)

♂ (Fig. 43). Darker than the preceding two species; basal two-thirds of fore wing dark olive brown, apical third similar, but mixed with chocolate-brown. Apical blotch rather faint. All lines present, but very faint due to dark ground colour. Hind wing with submedian area distinctly lighter, ochreous. Termen of hind wing forming angle of approximately 120° (rounded in other species). Anal flap on hind wing smaller and differing in shape from preceding species (Fig. 113). Underside with very broad terminal shade, especially on fore wing. Coremata as in *delusa* and *fletcheri*. Fore wing length: 16 mm.

GENITALIA ♂ (Fig. 130). Uncus short, not curved to form a hook, with short hairs, socii medium-sized. Valva short and strongly rounded, nearly semicircular. Juxta very large, with long lateral projections. Tegumen much shorter than vinculum. Aedeagus with median cornutus straight, apical cornutus curved, small.

GENITALIA ♀. Unknown.

DIAGNOSIS. The male is easily recognized as belonging to the *delusa*-group by the presence of the flap in the hind wing. The darker colour of this species distinguishes it from the other species in that group.

DISTRIBUTION. Known only from the holotype, which was collected from the Huanuco region of central Peru.

REMARKS. The new species takes its name after the type locality, Huanuco, in central Peru.

MATERIAL EXAMINED (1♂).
Holotype ♂, [**Peru**]: Pozuzu, Huanuco, 800–1000 m (*Hoffmanns*); *Perissopteryx delusa* Warr. [misidentification]; Rothschild Bequest B.M. 1939–1; (genitalia slide No. 13618; BMNH).

Other species in the genus

Perissopteryx griseobarbipes sp.n.

(Figs 44–49, 131, 164)

♂ (Figs 44–46), ♀ (Figs 47–49). Robust and large for *Perissopteryx*. Occurs in a greyish-brown and an olive form, with extensive ochreous scaling, especially on distal half of hind wing. Discal spot on fore wing black, on hind wing white. Lines complete, dark brown to ochreous. Apical blotch on fore wing only weakly developed. Underside: light grey to ochreous, densely irrorated with grey, but practically lacking a terminal shade. Apical blotch not visible from beneath. Discal spots present on underside of fore wing, but absent on hind wing. Thorax: robust, densely clothed in long hairs which are brown to olive in colour. Hind tibiae of males with large grey-brown hair pencils. Abdomen lacking coremata. Fore wing length: ♂ 17–18 mm; ♀ 16–18 mm.

GENITALIA ♂ (Fig. 131). Uncus medium-sized, straight, socii large. Valva short and narrow, apex rounded and with long and fairly strong hairs. Tegumen and vinculum very broad, base of vinculum rounded with a fairly small tip. Juxta characteristic, as in Fig. 131. Aedeagus very large and stout compared with rest of genitalia, with a single large cornutus.

GENITALIA ♀ (Fig. 164). Apophyses slender, posteriores longer than anteriores. Ductus bursae very short and stout. Corpus bursae large, spindle-shaped, with an appendix bursae; wall of ductus and corpus tough, wall of appendix more delicate.

DIAGNOSIS. Externally very similar to *P. raveni*. Both exhibit the same range of variation, occurring in a grey/brown and an olive/ochreous form, but the males may be separated readily by the presence (*griseobarbipes*) or absence (*raveni*) of the tibial hair-pencils. In the females, however, dissection of the genitalia is necessary for identification. In *P. griseobarbipes*, the bursa copulatrix is spindle-shaped, whereas in *raveni* it is typically pipe-shaped.

DISTRIBUTION. Most records are from Costa Rica, where the species has been found in Guanacaste, Cartago, and Puntarenas provinces. Possibly also Venezuela and Peru (see Remarks).

REMARKS. Two females from mainland South America (Venezuela: Merida; Peru: La Oroya, Rio Inambari, 3100 feet), which may represent *griseobarbipes* have been excluded from the type-series, which otherwise contains only Costa Rican females, because they show slight differences in the genitalia, and may belong to a closely related species.

The species name is derived from the ochreous-grey tibial hair-pencils of the males.

MATERIAL EXAMINED (11♂, 7♀).
Holotype ♂, **[Costa Rica]**: Guanacaste Prov[ince], Derrumbe, Estac[ion] Mengo, 1400 m, W side Volcan Cacao, 11 Jul[y] 1988, (*Janzen & Hallwachs*) (genitalia slide No. 14306; BMNH).

Paratypes. 1♂, same data as holotype (genitalia slide No. 13677; BMNH); 4♂, Guanacaste Prov[ince], Estacion Mengo, 1100 m, SW side Volcan Cacao, 27 May 1987, (*Janzen & Hallwachs*) (genitalia slide No. 13676; BMNH); 2♂ G[uanaca]ste Prov[ince], 4 km E Casetilla, Rincon Nat[ional] P[ar]k, 750 m elev[ation], 22 May 1982, (*Janzen & Hallwachs*) (genitalia slide No. 13656; BMNH); 1♀, same data, 14 Feb[ruary] 1983; 2♂, 2♀, Punt[arenas] Prov[ince], Monteverde, 15–16 May 1980, (*Janzen & Hallwachs*) (genitalia slide Nos 13636, 14314, 13639; BMNH); 1♂, same data, dated 25–26 Jun[e] 1979, 1400 m; 1♂, same data, dated 30–31 Jul[y] 1981; 1♂, same data, dated 23–25 Aug[ust] 1978, (*Janzen*); 1♂, same data, dated 8–10 Dec[ember] 1978, (*Janzen*) (genitalia slide No. 13653; BMNH); 2♀, Cartago Prov[ince], Moravia de Chirripo, 1000 m, 10 May 1983, (*Janzen & Hallwachs*) (genitalia slide Nos 13637, 14315); 1♀, Cachi; Joicey Bequest. Brit. Mus. 1934–120 (genitalia slide No. 13702; BMNH); 1♂, Orosi, 1200 m, Coll. Fassl; Joicey Bequest. Brit. Mus. 1934–120 (genitalia slide No. 13697; BMNH); 1♀, Sitio; June; Rothschild Bequest B.M. 1939–1 (genitalia slide No. 13577; BMNH) (BMNH, INBio).

Perissopteryx ochreobarbipes sp.n.

(Figs 50–53, 132, 165)

♂ (Figs 50, 51), ♀ (Figs 52, 53). Ground colour of wings ranging from ochreous to dark chocolate-brown, but always almost unicolorous, with little grey scaling. Costal margin with a blackish streak. Apical blotch on fore wing prominent. Median area of fore wing with a slightly iridescent, purplish tinge, which is especially noticeable in dark specimens. Lines complete. Discal spots small, especially on fore wing. Underside purplish grey with broad terminal shade. Apical blotch clearly visible. Discal spots present only on fore wing. Thorax, which is covered with long hairs, and anterior abdominal segments, concolorous with wings; posterior abdominal segments greyish. Hind tibia of male with large, whitish-ochreous hair-pencil. Abdomen without coremata. Fore wing length: ♂ 16–20 mm; ♀ 17–20 mm.

GENITALIA ♂ (Fig. 132). Uncus large, especially broad at base; apex with a subapical hook. Socii small. Valva rather narrow, pointed, with apex and inner margin with hairs sparsely distributed. Tegumen broad. Vinculum narrower than tegumen, with saccus forming a well defined tip. Aedeagus large, with few median cornuti and a group of apical cornuti.

GENITALIA ♀ (Fig. 165). Papillae anales narrow. Sterigma discernible as an area of heavier sclerotization. Ductus bursae extremely long and coiled. Corpus bursae large, rounded.

DIAGNOSIS. In general appearance, pale specimens of *P. ochreobarbipes* are quite similar to those of *P. submarginata*, but they are practically always larger, and readily separable from males of that species because of the presence of tibial hair-pencils. The shape of the bursa copulatrix in this species is unique and highly characteristic.

DISTRIBUTION. Recorded from Costa Rica and Colombia.

REMARKS. The name is derived from the ochreous tibial hair-pencils of the males.

MATERIAL EXAMINED.
Holotype ♂, [**Costa Rica**]: Alajuela Prov[ince], Estacion Pitilla, 700 m, 9 km S Santa Cecilia, Jul[y] 1988, (*Espinosa & Chaves*) (genitalia slide No. 13640; BMNH).

Paratypes. 3♂, 2♀, same data as holotype (genitalia slide No. 13681; BMNH); 2♂, 1♀, as holotype, (*Scoble & Brooks*); 1♂, Estacion Pitilla, 680m, 8 km S Santa Cecilia, 20 Nov[ember] 1987, (*Janzen & Hallwachs*); 1♂, as holotype, GNP Biodiversity Survey, UTM 330200.380200; 1♂, as holotype, June 1988 (*Espinosa*); 1♂, San José Prov[ince], La Montura, Braulio Carrillo Nat[ional] P[ar]k, 1100 m, 17 Dec[ember] 1981 (*Janzen & Hallwachs*) (genitalia slide No. 13678; BMNH); 2♂, San José Prov[ince], Estacion Carrillo, P[ar]k Nac[ional] Braulio Carrillo, 700 m, Sept[ember] 1984 (*Chacon*) (genitalia slide No. 13642); 2♂, data as before, August 1984; 1♂, data as before, November 1984; 1♀, data as before, April 1985; 1♀, G[uanaca]ste Prov[ince], 4 km E Casetilla, Rincon Nat[ional] P[ar]k, 18. Oct[ober] 1982 (*Janzen & Hallwachs*) (genitalia slide No. 13643; BMNH); 1♂, data as before, 11 April 1983; 2♂, data as before, 2 May 1982; 1♀, Derrumbe, Estacion Mengo, 1400 m, W side Volcan Cacao, 5 Jun[e] 1988 (*Janzen & Hallwachs*); 2♂, Cartago Prov[ince], Moravia de Chirripo, 1000m, 10 May 1983 (*Janzen & Hallwachs*); 1♂, Alajuela Prov[ince], F[in]ca San Gabriel, 16 km ENE Quebrada Grande, 650 m, July 1988, (*Gauld & Mitchell*); 1♂, Finca San Gabriel, 2 km SW Dos Rios, 600 m, Jun[e] 1988 (*Janzen & Hallwachs*); W85° 23′50″, N10°53′19″; 2♀, Cerro Campana, 650m, E side V[olcan] Cacao, 6km NW Dos Rios 15 Jun[e] 1988 (*Janzen & Hallwachs*). **Colombia**: 2♂, Muzo, 400–800 m, Coll. Fassl; L.B. Prout Coll. B.M. 1939–643. (genitalia slide No. 13512; BMNH); 1♀, Rothschild Bequest B.M. 1939–1 (genitalia slide No. 13515; BMNH); 1♂, Ost Columbia, Ob[erer] Rio Negro, 800 m, (*Fassl*); L.B. Prout Coll. B.M. 1939–643 (BMNH, INBio).

Perissopteryx ugaldei sp.n.

(Figs 54–56, 133, 166)

♂ (Figs 54, 55), ♀ (Fig. 56). Small. The species occurs in a grey-brown and an ochreous-olive form with extensive ochreous scaling, especially along the lines and on the hind wing. In the grey-brown form, all three lines are well developed on the fore wing, while the median line is practically absent in specimens of the olive form. The apical blotch is rather weakly developed in both forms. The discal spots are black on the fore wing and white on the hind wing, but may be almost absent. Grey-brown specimens often with additional grey markings in terminal areas of both wings. Underside: similar in both forms, brownish-grey with broad terminal shade. Discal spots discernible only on fore wing, apical blotch just visible. Abdomen without coremata. Fore wing length: ♂ 13–15 mm; ♀ 15 mm.

GENITALIA ♂ (Fig. 133). Uncus rather short, socii well developed. Valva long and broad, pointed, and with short, soft hairs on inner margin. Juxta large, shield-shaped, cleft. Vinculum becoming very broad and rounded towards base; saccus very short. Inner membranous parts of vinculum forming a pair of delicate sacs (? coremata). Aedeagus small and slender, with an angulated, stout median cornutus and approximately four narrow apical cornuti. Pointed process of median cornutus longer than blunt process.

GENITALIA ♀ (Fig. 166). Papillae anales long and narrow. Apophyses slender, posteriores about twice the length of anteriores. Sterigma a simple, broadly crescent-shaped area around the ostium. Ductus bursae about as long as corpus, moderately sclerotized. Corpus bursae elongated, pear-shaped, its wall delicate.

DIAGNOSIS. Together with *neougaldei*, this is the smallest species of *Perissopteryx*. In both species, the fore wings are narrower than in their congeners, from which they may also be distinguished by the very well-rounded vinculum. *P. ugaldei* may be distinguished from *P. neougaldei* (below) by the cleft juxta, and the angulated median cornutus the pointed process of which is longer than the blunt process. In the female, the best distinguishing characters are the more slender apophyses and the shorter and non-twisted condition of the ductus bursae in *ugaldei*.

DIAGNOSIS. Apparently restricted to Central America. Recorded from Mexico, Guatemala, and Costa Rica.

REMARKS. This species is named in honour of Alvaro Ugalde, Director of the Costa Rican System of National Parks and Conservation Areas, in recognition of more than two decades of unstinting dedication to the formation, growth and perpetual survival of Costa Rica's national parks.

MATERIAL EXAMINED.
Holotype ♂ [**Costa Rica**]: Osa Penin[sula] Sirena, Corcovado Nat[ional] P[ar]k, 5–11 Jan[u-

ary] 1981 (*Janzen & Hallwachs* (genitalia slide No. 14310; BMNH).

Paratypes. **Costa Rica**: 1♂, data as holotype, (genitalia slide No. 14325; BMNH); 1♂, Alajuela Prov[ince], Estacion Pitilla, 700 m, 9 km S Santa Cecilia, June 1988 (*Espinosa*) (genitalia slide No. 13634; BMNH); 1♂, data as before, 18 May 1988 (*Janzen & Hallwachs*) (genitalia slide No. 14316; BMNH); 1♂, Prov[ince] San José, Estacion Carrillo, P[ar]k Nac[ional] Braulio Carrillo, 700 m, Jun[e] 1985 (*Chacon & Chacon*) (genitalia slide No. 14309; BMNH); 1♂, Guanacaste Prov[ince], Santa Rosa National Park, July 1982, 300 m (*Janzen & Hallwachs*) (genitalia slide No. 14308; BMNH); 1♂, Orosi, 1200 m, Coll. Fassl; L.B.Prout Coll. B.M. 1939–643 (genitalia slide No. 13622; BMNH). **Mexico**: 1♂, (Mexique), Misantia, (Ver) (*Gugelmann*), reçu en juin 1912; Ex Oberthür Coll. Brit. Mus. 1927–3 (genitalia slide No. 14318; BMNH). **Guatemala**: 1♂,1♀ V[olcan] de Atitlan, 25[00]–3000 f[ee]t, Champion; Godman-Salvin Coll. 1903–4, B.C.A. Lep[idoptera] Het[erocera] *Pachydia divisaria* Walk. [misidentification] (genitalia slides No. 13672, 13705; BMNH); 1♂, data as before, plus handwritten label '*Thysanopyga apicitruncaria* H.-S., so named in Coll Stgr (followed by an undecipherable word) Ribb' [misidentification] (genitalia slide No. 13704; BMNH).

Perissopteryx neougaldei sp.n.

(Figs 57–60, 134, 167)

♂ (Figs 57, 58), ♀ (Figs 59, 60). Indistinguishable from males of *P. ugaldei*, and also occurring in two colour forms. Abdomen without coremata. Fore wing length: ♂ 14–15 mm; ♀ 15 mm.

GENITALIA ♂ (Fig. 134). Uncus, socii, and shape of valva as in *ugaldei*. Shape of juxta as in Fig. 134, not cleft. Vinculum broader, lateral arms almost forming a circle. Aedeagus with pointed process of median cornutus shorter.

DIAGNOSIS. Very similar to *P. ugaldei* in appearance. In the male genitalia, *neougaldei* is best distinguished from that species by the juxta, which is differently shaped and not cleft, and the shorter pointed process of the angulated median cornutus. Also, the membranous sacs formed by the vinculum are larger in *neougaldei*. In the female genitalia (but see Remarks), *neougaldei* is characterized by a longer and twisted ductus bursae, stouter apophyses, and a different sterigma.

DISTRIBUTION. Known with certainty only from Costa Rica. The females (below) provisionally associated with the male types are from the South American mainland (Colombia, Venezuela, Brazil).

REMARKS. Three females from mainland South America (Colombia: Purnio; Venezuela; Brazil: La Chima (BMNH)), may belong to *neougaldei*. (Two of the specimens are illustrated in Figs 59, 60.) However, their conspecificity with the male holotype and paratype, which were collected in Costa Rica, is uncertain so they are excluded from the type-series. The female genitalia (Fig. 167) may be described thus: Papillae anales narrow. Both pairs of apophyses stout, posteriores nearly twice length of anteriores. Sterigma a broadly crescent-shaped sclerite. Ductus bursae very long and twisted just above corpus bursae. Corpus bursae strongly elongated, with bulla branching off from anterior half. Wall of bursa delicate, with a few fine longitudinal lines in its posterior part.

The specific name was chosen because of the extreme similarity of this species to *P. ugaldei*.

MATERIAL EXAMINED.

Holotype ♂, [**Costa Rica**]: Punt[arenas] Prov[ince], 35 km S Palmar Norte, 7–8 Jan[uary] 1983, 150 m elev[ation], 8° 45′ × 83° 20′ (*Janzen & Hallwachs*) (genitalia slide No. 13638; BMNH).

Paratype. **Costa Rica**: 1♂, Osa Penin[sula], Sirena, Corcovado Nat[ional] P[ar]k, 1 May 1984 (*Janzen & Hallwachs*) (genitalia slide No. 13675; BMNH).

Perissopteryx submarginata (Schaus, 1911) comb.n.

(Figs 61, 62, 135, 168)

Thysanopyga submarginata Schaus, 1911: 595. LECTOTYPE ♀, [COSTA RICA] (NMNH), here designated [examined].

♂ (Fig. 61); ♀ (Fig. 62). Wings ochreous to fairly dark brown, finely striated with grey, but without maculation. In most specimens, faint lilac tinge visible. Fore wing with lines complete; median line straight, subbasal and postmedian lines curved; hind wing with a nearly straight antemedian and a curved subterminal line. The subbasal line on the fore wing and the subterminal line on the hind wing are much fainter than the other lines. Costal margin with a blackish streak. Apical blotch well developed, nearly pure cream white. Discal spots minute. Underside: grey with darker irroration, terminal shade

broad, purplish-brown. Apical blotch as clear as on upperside. Abdomen brown on anterior segments, more grey on posterior segments. Abdomen of males with two pairs of small pouches on segments 7 and 8 bearing hair pencils. Females larger than males. Fore wing length: ♂ 14–16 mm; ♀ 15–17 mm.

GENITALIA ♂ (Fig. 135). Uncus and socii moderately large, uncus with a small subapical hook. Valva broad and well rounded, apical region and inner margin densely covered with soft hairs. Tegumen and vinculum of equal length and width, saccus forming a small plate rather than a tip. Aedeagus short, flask-shaped, with a single, fairly large median cornutus.

GENITALIA ♀ (Fig. 168). Papillae anales long and narrow; both pairs of apophyses slender, posteriores nearly twice as long as anteriores. Shape of sterigma as in Fig. 168. Ductus bursae fairly long, with one side heavily sclerotized. Corpus bursae elongated, its wall delicate except for a posterior sclerotized section situated between the end of the ductus bursae and the ductus seminalis.

DIAGNOSIS. Similar in appearance to *P. ochreobarbipes* (above) and *P. submarginatella* (below). In size, *P. submarginata* is intermediate between the two. Males of *P. ochreobarbipes* can be easily identified by the presence of light ochreous tibial hair-pencils, and both sexes lack the subterminal line on the hind wing. *P. submarginata* and *ochreobarbipes* are sympatric in Costa Rica, but *submarginata* and *submarginatella* seem to be allopatric (see Distribution). Where no locality information is available, they can be separated only by dissecting the genitalia. In the male, *submarginata* is best distinguished from *submarginatella* by the rounded valva, larger and rounded vinculum and broader aedeagus. In the female, although the bursa copulatrix of both species is elongated, that of *submarginata* is distinguishable by the presence of localized sclerotizations.

DISTRIBUTION. Collected only from Costa Rica.

MATERIAL EXAMINED (10♂, 5♀).
Lectotype ♀, [**Costa Rica**]: Juan Vinas; Jan[uary]; Type No. 17453 U.S.N.M.; *Thysanopyga submarginata* Schaus Type (handwritten) (NMNH) [examined].

Paralectotype. **Costa Rica**: 1♂, Mar[ch], Sixola Riv[er], CR; Schaus and Barnes coll.; *Thysanopyga submarginata* Schaus [handwritten] (NMNH) [examined].

Other material. **Costa Rica**: Alajuela Province: Estacion Pitilla, 9 km S Santa Cecilia, 700 m; Finca La Campana, El Ensayo, 7 km NW Dos Rios, 700 m; Finca San Gabriel, 2 km SW Dos Rios, 600 m; Cerro Campana, 650 m, E side Volcan Cacao, 6 km NW Dos Rios. San José Province: Estacion Carrillo, Braulio Carrillo National Park, 700 m. Limon Province: 9.4 km W Bribri, Suretka, 200m (INBio).

Perissopteryx submarginatella sp.n.

(Figs 63, 64, 136, 169)

♂ (Fig. 63), ♀ (Fig. 64). Colour and markings as in *P. submarginata* (Schaus), from which it is externally indistinguishable, although usually slightly smaller. Abdomen of males also with two pairs of small pouches on segments 7 and 8, bearing small hair pencils. Fore wing length: ♂ 13–15 mm; ♀ 17 mm.

GENITALIA ♂ (Fig. 136). Uncus fairly large, curved, with an additional small subapical hook. Socii absent. Valva pointed, but densely hairy over entire surface and therefore superficially appearing rounded. Tegumen large, roughly triangular and narrowing towards uncus. Vinculum small, rectangular, with saccus short and blunt. Aedeagus long and nearly straight, with a single, small, very weakly sclerotized elliptical cornutus.

GENITALIA ♀ (Fig. 169). Papillae anales slightly pointed. Both pairs of apophyses very slender, posteriores about twice length of anteriores. Sterigma a circular sclerotized area. Ductus bursae fairly long and quite well sclerotized, corpus bursae strongly elongated, delicate, and with very fine longitudinal lines.

DIAGNOSIS. Similar to *P. submarginata*, but the two species are largely, although not entirely, allopatric so that locality data together with the smaller size of *submarginatella* can be helpful in recognition. In *submarginatella* the male genitalia differ from those of *submarginata* in having a pointed valva, a smaller, rectangular vinculum, and a more slender aedeagus. In the female genitalia, *submarginatella* may be recognized by its more slender apophyses and the absence of the very distinct sclerotizations on the bursa copulatrix.

DISTRIBUTION. Widespread in South America, but records are not numerous. It has been collected in Peru, Brazil, and French Guiana. There is also an isolated record from the Cerro Zunil area in Guatemala.

REMARKS. The ending *-ella*, denoting a diminutive, was chosen because of the resemblance of

the new species to small individuals of *P. submarginata* (Schaus).

MATERIAL EXAMINED.
Holotype ♂, [**French Guiana**]: (Guyane Française), St. Laurent de Maroni, Collection Le Moult; Mars; 67.20. (*Brabant*) 1920; Joicey Bequest Brit. Mus. 1934–120 (genitalia slide No. 14329; BMNH).

Paratypes (3♂,1♀): **Guatemala**: 1♀, Cerro Zunil, 4–5000 f[ee]t, Champion; Godman-Salvin Coll. 1903–4, B.C.A. Lep[idoptera] Het[erocera] *Pachydia divisaria* Walk. [misidentification] (genitalia slide No. 14359; BMNH). **Brazil**: 2♂, Para (*Moss*); Rothschild Bequest B.M. 1939–1. (genitalia slide No. 13514) (BMNH). **Peru**: 1♂, Yahuarmayo, 1399, 1200 f[ee]t, April 1912; L.B. Prout Coll. B.M. 1939–643 (genitalia slide No. 14328; BMNH).

P. ochrilinea and *P. gamezi*

These two species may constitute a monophyletic group. Probable derived characters in the male genitalia are a distinctly star-shaped juxta and the presence of hairs along the inner margin of the tegumen.

Perissopteryx ochrilinea (Warren, 1904) **comb.n.**

(Figs 65–68, 137, 170)

[*Thysanopyga pygaria* 'ab.' *ochrilinea*, Warren, 1897: 478. [JAMAICA: Newcastle] as an 'ab.', see Remarks.]

Thysanopyga ochrilinea Warren, 1904: 125. LECTOTYPE ♂, JAMAICA (BMNH), here designated [examined].

♂ (Figs 65, 66), ♀ (Figs 67, 68). Of medium size for the genus, with broad wings, but a rather slender body. Abdomen of males without coremata. Occurs in two different forms. The species was originally described from the olive-ochreous form by Warren. *Olive-grey form*: fore wing and basal half of hind wing olive-grey. Extensive ochreous scaling on distal half of hind wing and along the costal margin and subbasal and postmedian lines of fore wing. Median line on fore wing weakly developed to absent, antemedian line on hind wing absent. Discal spots dark brown on fore wing, white on hind wing, small. Apical blotch moderately well developed, rather dark. Underside: ochreous, heavily dusted with grey, especially in terminal area. Discal spots and apical blotch practically absent. *Brown-grey form*: wings brownish grey, finely striated with darker grey over basal two thirds, but chocolate-brown in terminal areas. Fore wing with straight, or nearly straight, subbasal and median lines and a concave median line. Apical blotch and discal spots as above. Hind wing with median line present. Underside: light grey, irrorated with darker scales. Terminal shade moderately broad, without clear margin. Discal spots discernible on fore wing only, apical blotch faint. Fore wing length: ♂ 15-16 mm; ♀ 16 mm.

GENITALIA ♂ (Fig. 137). Uncus fairly long, straight. Valva moderately broad, pointed. Inner valval margin with a large hair-tuft. Inner margin of tegumen hairy. Juxta large, star-shaped. Aedeagus short and stout, with a single large cornutus with apical serrations.

GENITALIA ♀ (Fig. 170). Papillae anales and apophyses normal. Sterigma elliptical. Ductus bursae long and narrow, membranous. Corpus bursae pear-shaped to rounded, with a small, lateral appendix bursae. Wall of bursa membranous.

DIAGNOSIS. The species is difficult to recognize and may be confused with a range of others. Specimens of the olive-grey form may be confused with *P. suffecta*, *divisaria*, *muzonensis*, *trinidadicola*, and others. However, some help may be gained from distributional data, since *ochrilinea* seems to be restricted to Jamaica and British Guyana. *P. ochrilinea*, and *P. gamezi*, (described below), may be distinguished from all other species of *Perissopteryx* by their star-shaped juxta (Figs 195, 197). The most useful characters for separation of *ochrilinea* and *gamezi* are the straight and not dilated uncus, the smaller and rounded vinculum, and the larger cornutus in *ochrilinea*. The female of *ochrilinea* is easily recognized by its corpus bursae, which possesses a lateral appendix.

DISTRIBUTION. Specimens are known only from Jamaica and Guyana.

REMARKS. Originally, Warren (1897) used the name *ochrilinea* for an aberration of *Thysanopyga pygaria*. Since this is of infrasubspecific rank, it falls outside the regulations of the International Code of Zoological Nomenclature (1985). Seven years later, however, he regarded *ochrilinea* as a distinct species (Warren, 1904: 125). Hence 1904 is the date of the species description. The type series (two male syntypes) have very well-developed ochreous markings, a condition which seems to be rather rare. All intermediates between these and the grey-brown individuals occur.

MATERIAL EXAMINED (7♂, 3♀).
Lectotype ♂, [**Jamaica**: Newcastle]; *Thysanopyga* [handwritten]; N.Z.iv.478, ab. *ochrilinea* Warren ♂ Type; Rothschild Bequest B.M. 1939-1 (genitalia slide No. 13661; BMNH) [examined].

Paralectotype. **Jamaica**: 1♂, Newcastle, Aug[ust] [18]93; *Thysanopyga pygaria* Gn. ab. *ochrilinea* Warr. 1897, ♂ paratype [handwritten]; Rothschild Bequest, B.M. 1939-1 (genitalia slide No.13576) (BMNH) [examined].

Other material. **Jamaica**: Newcastle. **Guyana** (BMNH).

Perissopteryx gamezi sp.n.

(Figs 69-72, 138, 171)

♂ (Fig. 138), ♀ (Fig. 171). Rather small. Wings ochreous to greyish-brown, rarely brown, with heavy grey dusting. Both wings with sparse darker maculation in terminal area. Lines complete. Discal spots normal (black on fore wing, white on hind wing), but small and sometimes absent. Apical blotch of normal size, but dark and inconspicuous. Underside: greyish ochreous with fine grey irrorations, terminal shade darker, without precise margin. Discal spots faintly visible on fore wing, apical blotch hardly discernible. An olive-grey and ochreous form also occurs, but more rarely. Abdomen of males without coremata. Fore wing length: ♂ 13-15 mm; ♀ 14-15 mm.

GENITALIA ♂ (Fig. 138). Uncus large, dilated towards apex, socii small. Valva long and narrow, pointed. Tegumen triangular, slightly longer than vinculum, with inner margin hairy. Juxta star-shaped as in *ochrilinea*. Base of vinculum intermediate between the rounded and the rectangular type. Aedeagus moderately large, straight, with a single large, but not very large, cornutus.

GENITALIA ♀ (Fig. 171). Apophyses slender, posteriores not much longer than anteriores. Sterigma crescent-shaped. Ductus bursae long, fairly broad near ostium and broadening towards corpus bursae, central part narrower. Corpus bursae large, membranous, its posterior part somewhat angular.

DIAGNOSIS. The male genitalia of *P. gamezi* are most similar to those of *P. ochrilinea*, although the species do not closely resemble each other externally. In size and markings *gamezi* is much more similar to *P. divisaria* (Walker) and its close allies. As stated in the diagnosis of *P. ochrilinea* (above), that species and *gamezi* can be separated from the other, externally similar *Perissopteryx* species by the conspicuous star-shaped juxta in the male. The most useful characters to separate *gamezi* from *ochrilinea* are the longer and dilated uncus, larger and rather rectangular vinculum and smaller cornutus in *gamezi*. In the female genitalia, *gamezi* can be recognized by the large, membranous, and somewhat rectangular corpus bursae, which appears to be very large compared with the long and narrow ductus bursae.

DISTRIBUTION. A Central American species known mainly from Costa Rica. A single specimen from S. Mexico: Orizaba has also been observed.

REMARKS. This species is named in honour of Dr Rodrigo Gámez, Director of the National Biodiversity Institute of Costa Rica, in recognition of his tireless efforts in aiding Costa Rican biodiversity administration to evolve in response to society's needs.

MATERIAL EXAMINED.
Holotype ♂, [**Costa Rica**]: Guanacaste Prov[ince], Estacion Mengo, 1100 m, SW side Volcan Cacao, Jul[y] 1987 (*Janzen & Hallwachs*) (genitalia slide No. 14317; BMNH).

Paratypes (5♂, 2♀): **Costa Rica**: 1♂, Guanacaste Prov[ince], Rincon Nat[ional] P[ar]k, 22 Dec[ember] 1978 (*Janzen*) (genitalia slide No. 14319; BMNH); 1♀, same data, dated 19 Nov[ember] 1979 (genitalia slide No. 14311) (BMNH); 1♂, Punt[arenas] Prov[ince], Monteverde, 1400 m, 25-26 Jun[e] 1979, (*Janzen*) (genitalia slide No. 14324; BMNH); 2♂, Underwood; Rothschild Bequest, B.M. 1939-1 (genitalia slides No. 14290, 14291) (BMNH); 1♀, 22.24. San José (*Schmidt*); Joicey Bequest, Brit.Mus. 1934-120 (genitalia slide No. 14320; BMNH). **Mexico**: 1♂, Orizaba, March [18]96 (*Schaus*); *Pachydia divisaria* Walk. [misidentification] [handwritten]; Rothschild Bequest B.M. 1939-1 (genitalia slide No. 14284; BMNH).

P. raveni, P. suffecta, and *P. intermedia*

The following three species probably constitute another monophyletic species-group within *Perissopteryx*. The male genitalia are extremely similar, except for the juxta, and the aedeagus is characterized by a single, needle-like cornutus of varying length and apical serrations on the vesica.

***Perissopteryx raveni* sp.n.**

(Figs 73-75, 139, 172)

♂ (Figs 73, 74), ♀ (Fig. 75). Fairly robust, occurring in two forms. Thorax and abdomen concolorous with wings in both forms. Male abdomen with two pairs of coremata, bearing large hair pencils. *Grey-brown form*: wings of a uniform medium brown, dusted with grey. All three lines on fore wing and median line on hind wing well developed. Apical blotch dark, inconspicuous. Discal spots small; black on fore wing, white on hind wing. Underside: grey-ochreous, with dense dark dusting, especially towards termen. Terminal shade better developed in males. Apical blotch and discal spots absent or nearly so. *Olive-grey form*: areas normally ochreous on other species are brick-red. Median lines absent on both wings. Apical blotch nearly absent. Underside grey with heavy dark dusting, with a lighter postmedian fascia on both wings. Fore wing length: ♂ 15-17 mm; ♀ 16 mm.

GENITALIA ♂ (Fig. 139). Uncus long and narrow, socii small. Valva long and pointed, arising from base of vinculum and nearly entirely devoid of hairs. Tegumen rounded in outline, becoming slightly narrower towards uncus. Juxta somewhat rectangular. Vinculum about 1.5 times length of tegumen, its base not rectangular; saccus forming a broad, stout tip. Aedeagus very long, with a single, needle-like cornutus nearly equalling length of aedeagus. Apex of vesica very finely serrated.

GENITALIA ♀ (Fig. 172). Both pairs of apophyses narrow and delicate. Ostium and sterigma as in Fig. 172. Ductus bursae short. Bursa copulatrix characteristically pipe-shaped, with conspicuous sclerotizations.

DIAGNOSIS. Externally indistinguishable from *smithi*. *P. ochreobarbipes* and *griseobarbipes* are also similar, but the males can be distinguished by the presence of tibial hair-pencils compared with their absence in *raveni*. In the female genitalia, *raveni* is clearly recognizable by its pipe-shaped bursa copulatrix. In the male genitalia, confusion is likely only with *P. suffecta* and *intermedia* (described below). These three species are best separated by the length of the single, needle-like cornutus: in *raveni*, it is nearly as long as the aedeagus, while in *suffecta* and *intermedia* it attains half and one-third of its length, respectively. In addition, the juxta is rather rectangular in *raveni* and *suffecta*, but broadly pointed with lateral projections in *intermedia*.

DISTRIBUTION. Costa Rica.

REMARKS. This species is named in honour of Dr Peter Raven, Director of the St. Louis Botanical Garden, in recognition of his tireless efforts on behalf of the conservation of tropical biodiversity in general, and Costa Rican biodiversity specifically.

MATERIAL EXAMINED.

Holotype ♂ [**Costa Rica**]: Punt[arenas] Prov[ince], Monteverde, 1400 m, 25-26 Jun[e] 1979 (*Janzen*) (genitalia slide No. 14312; BMNH).

Paratypes: 1♂, same data as holotype (genitalia slide No. 14307; BMNH); **Costa Rica**: 1♂, Cartago Prov[ince], Moravia de Chirripo, 1114 m, 14 Jan[uary] 1986, (*Chacon & Chacon*) (genitalia slide No. 14313; BMNH); 1♂, Cashi, 3300 f[ee]t, 23.ix.–14.x.1912 (C.H. Lankester); Rothschild Bequest B.M. 1939-1 (genitalia slide No. 13700) (BMNH); 1♀, Cartago Prov[ince], 3 km S Casa Mata, 16 km S San Isidro de Tajar, 1800 m, Interamericana, 4 Dec[ember] 1988, (*Janzen & Hallwachs*) (genitalia slide No. 14323; BMNH); 2♀, Orosi, 1200 m, Coll. Fassl; Joicey Bequest Brit. Mus. 1934-120 (genitalia slides No. 13688, 13694; BMNH).

***Perissopteryx suffecta (Warren, 1904)* comb.n.**

(Figs 76, 77, 140)

Thysanopyga suffecta Warren, 1904: 125. Holotype ♂, BOLIVIA (BMNH) [examined].

♂ (Figs 76, 77). Medium-sized for the genus. Abdomen of males with two pairs of coremata. Occurs in an olive-grey and an ochreous-grey form. *Olive-grey form*: wings ochreous, very thickly dusted with olive. Fore wing with subbasal and postmedian line present, ochreous, median line absent on both wings. A weak ochreous streak along the costa of the fore wing, apical blotch nearly absent, discal spots present, but not conspicuous. Postmedian area of hind wing with an ochreous fascia. Underside: light ochreous, heavily dusted with grey, terminal shade olive-grey. Discal spots and apical blotch absent. *Ochreous-grey form*: wings ochreous, thickly dusted with grey. Fore wing with all lines present; hind wing with median line present. Costa of fore wing with a weak greyish streak; apical blotch not conspicuous, discal spots distinct. Terminal area of hind wing with faint grey maculation. Underside: of same ground colour as upperside, less heavily dusted. Hind wing lacking terminal shade, apical blotch and discal spots.

Fore wing length: ♂ 16 mm.

GENITALIA ♂ (Fig. 140). Uncus large, socii absent. Valva long, rather narrow, slightly pointed apically and practically devoid of hairs. Juxta rather rectangular. Vinculum longer than tegumen, its base of the rounded type. Aedeagus long, slightly curved posteriorly, with a single needle-like cornutus of around one-third the length of the aedeagus. Vesica with rather strong apical serrations.

GENITALIA ♀. Unknown.

DIAGNOSIS. See also diagnosis for *raveni*, above, and *intermedia* below. The holotype is very similar in size and markings to the corresponding forms of *divisaria* and *ochrilinea*. In the male genitalia, confusion is only possible with *raveni* and *intermedia*; the differences are described in the diagnosis of *raveni*, above.

DISTRIBUTION. Peru and Bolivia.

MATERIAL EXAMINED (3♂).
Holotype ♂, [**Bolivia**]: Chulumani, 2000 m, i.[19]01, wet s[eason] (*Simons*); xi p.125 [handwritten]; Rothschild Bequest B.M.1939-1 (genitalia slide No. 14329; BMNH).

Other material. **Bolivia**: Chulumani, 2000 m. **Peru**: Santo Domingo, Carabaya, 6500 feet (BMNH).

Perissopteryx intermedia sp.n.

(Figs 78, 141)

♂ (Fig. 78). Medium-sized for the genus. Both wings olive-grey; heavily striated. Median line absent, fore wing with subbasal and postmedian lines doubly ochreous and brown, fairly straight. Costa of fore wing with a faint ochreous streak. Apical blotch weak; discal spots of normal size, black on fore wing, white on hind wing. Hind wing with a broad ochreous postmedian fascia. Underside dark, fuscous grey, with a broad, grey terminal shade. Apical blotch very faint, fore wing discal spots clear. Vestiture of thorax and abdomen of the same olive-grey as wings. Abdomen of males with two pairs of coremata. Fore wing length: 16 mm.

GENITALIA ♂ (Fig. 141). Uncus long, finely pointed, socii absent. Valva long, rather narrow, pointed, but not acutely so; practically devoid of hairs. Shape of juxta as shown in Fig. 141, not rectangular, but broadly pointed and with lateral projections. Vinculum longer than the tegumen, its base of the rounded type. Aedeagus long, mildly curved posteriorly, with a single, needle-like cornutus which is roughly half as long as the aedeagus. Vesica with apical serrations.

GENITALIA ♀. Unknown.

DIAGNOSIS. The olive-grey holotype is currently the only specimen known. It is very similar to the corresponding forms of *suffecta*, *divisaria* (Walker), *ochrilinea*, and *smithi*. The male genitalia of *intermedia* are most similar to those of *suffecta* and *raveni*. The single needle-like cornutus which characterizes them is longest in *raveni*, shortest in *suffecta*, and of intermediate length in *intermedia*. The juxta of *suffecta* and *raveni* is roughly rectangular in shape, while that of *intermedia* is entirely different.

DISTRIBUTION. Known only from the type locality in Ecuador.

MATERIAL EXAMINED.
Holotype ♂, [**Ecuador**]: Hacienda Cayandeled, Prov[ince] Rio Bamba (Versant Ouest Cordilleres), 42001, Février 1883, Stolzmann; Ex Oberthür Coll. Brit. Mus. 1927-3 (genitalia slide No. 14378; BMNH).

P. smithi, P. divisaria, P. bozae, P. trinidadicola, and *P. muzonensis*

These five species may form another species-group, all being characterized by an angulated median cornutus, which consists of several parts. However, this is by no means certain. *P. ugaldei* and *P. neougaldei* (above) also have an angulated median cornutus, but the association of these two species with the five mentioned here is uncertain.

Perissopteryx smithi sp.n.

(Figs 79-81, 142, 173)

♂ (Fig. 79), ♀ (Figs 80, 81). A fairly large and robust-bodied species of *Perissopteryx*. The species occurs in a brown and an olive-ochreous form. Vestiture of thorax and abdomen concolorous with wings in both forms. Abdomen of male with two pairs of coremata. Females tend to show more variation in ground colour and size than males. *Brown form*: wings nearly unicolorous, ranging from ochre to rich brown, densely striated with grey. Fore wing with all 3 lines present, median line frequently the most prominent. Apical blotch rather inconspicuous. Discal spots black on fore wing, white on hind wing, small. Hind wing with median line usually prominent, but sometimes virtually absent. Underside ochreous to grey-brown with broad terminal

shade. Apical blotch hardly visible, discal spots present or absent. *Olive-ochreous form*: only one specimen has been examined. Groundcolour of wings ochre. Fore wings very heavily striated with olive, so appearing nearly unicolorous olive-grey. Hind wings fairly thickly striated in basal half; terminal half predominantly ochreous. Median line absent on hind wing and practically absent on fore wing. Subbasal and postmedian lines on fore wing ochreous. Apical blotch moderately conspicuous, discal spots normal. Underside dark grey-brown, with prominent terminal shade. Apical blotch and discal spots clearly visible. Fore wing length: ♂ 15-18 mm; ♀ 16 mm.

GENITALIA ♂ (Fig. 142). Uncus long and narrow, socii medium-sized. Valva long and pointed, inner margin hairy. Tegumen broad and compact, approximately rectangular. Juxta as in Fig. 142. Vinculum markedly longer than tegumen, its base rectangular, saccus forming a well-defined tip. Aedeagus long, with slender angulated median cornutus and 2-3 apical cornuti; end of vesica with serrations.

GENITALIA ♀ (Fig. 173). Papillae anales narrow. Apophyses posteriores long and slender, apophyses anteriores shorter and slightly more robust. Sterigma broadly crescent-shaped. Ductus bursae long and bearing longitudinal striations. Corpus bursae fairly small and rounded, membranous.

DIAGNOSIS. A fairly robust species, externally similar to *bozae* (described below) and *P. raveni*. *P. bozae* and *P. smithi* may be recognized by their larger genitalia and longer vinculum than in the other species with an angulated median cornutus. The best characters for separation of *smithi* and *bozae* are found in the aedeagus. In *smithi* it is longer, with an elongated and slender median cornutus, three apical cornuti, and serrations at the apex of the vesica, but in *bozae* it is shorter, with a more robust median cornutus, two apical cornuti and a vesica bearing a group of minute cornuti instead of a serration. In the female genitalia, both *smithi* and *bozae* have a long ductus bursae, and a corpus which is broader than long. However, there are differences in the structure of the sterigma and the shape of the corpus bursae (Figs 173, 175).

DISTRIBUTION. Apparently widespread, with records from Colombia, Bolivia, and Peru. Not recorded from Central America.

REMARKS. This species is named in honour of Ted Smith, Director of the Consultative Group on Biological Diversity, for his unflagging and thankless task of attracting foundation support to the conservation of tropical biodiversity in general, and Costa Rican biodiversity specifically.

MATERIAL EXAMINED.
Holotype ♂, **[Peru]**: 1903-295 (genitalia slide No. 14375; BMNH).

Paratypes. **Bolivia**: 1♂, E. Bolivia, Buenavista, July-Oct[ober] 1906 (*Steinbach*); Rothschild Bequest B.M. 1939-1 (genitalia slide No. 13624; BMNH). **Colombia**: 1♂, Ost Colombia, Ob[erer] Rio Negro, 800 m, Coll. Fassl; Rothschild Bequest B.M. 1939-1 (genitalia slide No. 13625; BMNH); 1♂, Muzo, 400-800 m (*Fassl*); Joicey Bequest Brit. Mus. 1934-120. **Peru**: 1♂, Chanchamayo; Joicey Bequest Brit. Mus. 1934-120; *Pachydia abdominaria* Gn. [misident.] (genitalia slide No. 14724; BMNH); 1♂, C. Peru, La Merced; 3000-4500 f[ee]t,i,ii '20, (*Watkins*); 6.20; Joicey Bequest Brit. Mus. 1934-120 (genitalia slide No. 14371; BMNH); 1♀, La Oroya, R[io] Inambari, Sept[ember] 1904, 3100 f[ee]t, dry seas[on] (*Ockenden*); Rothschild Bequest B.M. 1939-1 (genitalia slide No. 13703; BMNH).

Perissopteryx divisaria (Walker, 1861) **comb.n.**

(Figs 82-84, 143, 174)

Tephrina divisaria Walker, 1861: 960. Holotype ♂, VENEZUELA (BMNH)[examined] .
Pachydia divisaria (Walker); Druce, 1893: 136. [Probably misidentified.]

♂ (Figs 82, 83), ♀ (Fig. 84). Fairly small; occurring in two forms. Thorax and abdomen concolorous with wings in both forms. *Ochreous-grey form:* ochreous, densely dusted with grey. Lines complete, but fainter in females. Terminal area of fore wing with inconspicuous grey and brown maculation. Apical blotch of normal size, but dark. Discal spots black on fore wing, white on hind wing, small to reduced. Underside: lighter than upperside, terminal shade darker, but not well developed. Discal spots visible on fore wing only. Apex of fore wing often with a small black spot. *Olive-ochreous form*: fore wing olive-grey, as in typical *ochrilinea*; subbasal and postmedian lines ochreous, edged with brown; median line simple, brown. Costal margin with ochreous streak. Terminal area with pure brown maculations. Hind wing: median line weakly developed, a broad ochreous fascia in subterminal area. Discal spot white, sometimes very small. Underside: postmedian line on fore wing visible from

beneath, denoting the margin of the terminal shade. Fore wing length: ♂ 13-15 mm; ♀ 15-16 mm.

GENITALIA ♂ (Fig. 143). Uncus broadest near middle, spindle-shaped. Valva moderately broad, pointed; inner valval margin with soft hairs and a conspicuous group of strong setae at base. Tegumen trapezoidal, shorter than vinculum. Base of vinculum of the rectangular type, with a well-defined tip. Aedeagus with angulated median cornutus and 2-5 apical cornuti.

GENITALIA ♀ (Fig. 174). Papillae anales narrow. Apophyses posteriores long and slender, apophyses anteriores much shorter and stout. Sterigma fairly conspicuous, broadly crescent-shaped. Ductus bursae very long, twisted several times, its wall with longitudinal striations. Corpus bursae small, rounded, its wall membranous.

DIAGNOSIS. Externally, closest to *gamezi* and to the holotype of *trinidadicola* (described below). In the male genitalia, the group of strong setae occurring at the base of the inner valval margin is helpful in the recognition of *divisaria* (see Fig. 143). The female genitalia are rather similar to those of *trinidadicola*, but they differ in the structure of the ductus bursae and the sterigma (compare Figs 174, 176). In addition, *divisaria* is widespread on the S. American mainland, while *trinidadicola* is restricted to Trinidad.

DISTRIBUTION. Apparently widely distributed in mainland S. America, but not extending into Central America (see Remarks). Most specimens examined have been collected in Brazil with additional records from Peru and Paraguay.

REMARKS. Druce (1893: 136) noted that *P. divisaria* is common in Guatemala and also occurs in Panama and Mexico. These records probably refer rather to one or more of *P. gamezi*, *ugaldei*, or *neougaldei*, all of which occur in Central America. *P. divisaria* seems only to occur in continental S. America.

The original description of *Tephrina divisaria* Walker is based on a single male from Venezuela. Unfortunately, the abdomen of the holotype (including the genitalia), which is housed in the BMNH, is in very poor condition thus rendering it difficult to establish the identity of the species in the face of several similar species. However, since *gamezi*, the species externally most similar, is restricted to Central America, the identity of *divisaria* is here established as the South American species described and figured above.

MATERIAL EXAMINED (11♂, 2♀).
Holotype ♂, [**Venezuela**]: 26.*Tephrina divisaria*; (BMNH).

Brazil: W. Brazil, Calama, Rio Madeira, below Rio Machados; Jaragua do Sul, Santa Catharina [*sic*]; Hansa Humboldt, Santa Catarina, 60 m; Minas Gerais, Uberaba; Castro, Parana, 950 m; Novo Friburgo; La Chima. **Paraguay**: Sapucay. **Peru**: La Union, Rio Huacamayo, Carabaya, 2000 feet (BMNH).

Perissopteryx bozae sp.n.

(Figs 85, 86, 144, 175)

♂ (Fig. 85). Medium-sized with relatively broad wings. Wings dark ochreous with heavy grey striation and additional irregular grey maculation in postmedian area of both wings. Apical blotch dark, only with a whitish dot beneath the apex. All lines well developed, discal spots small. Underside fairly dark ochreous grey, terminal shade therefore not pronounced. Discal spots and apical blotch nearly absent. Dorsal side of thorax and abdomen of the same brown as wings. Male abdomen with two large pairs of coremata. Fore wing length: ♂ 16 mm.

GENITALIA ♂ (Fig. 144). Uncus moderately long; socii well developed. Valva long and fairly narrow, apex pointed, but not acutely so, inner margin hairy. Juxta broadly pointed with lateral projections. Base of vinculum of the rectangular type; saccus with a large tip. Aedeagus with angular median cornutus robust, two subapical and three very small apical cornuti.

GENITALIA ♀. See Remarks.

DIAGNOSIS. This is a fairly dark and broad-winged *Perissopteryx*. Particularly similar in appearance are *smithi*, *raveni*, and *muzonensis* (described below). In the genitalia, however, close similarities only exist with *smithi* (above), and a detailed diagnosis is given under that species.

DISTRIBUTION. Ecuador and, possibly, Guatemala (see Remarks).

REMARKS. A female from Guatemala (Volcan Santa Maria, July, BMNH) thought to be *bozae* is described as follows: colour and markings (Fig. 86) similar to male. Fore wing length: 17 mm. Genitalia (Fig. 175) (Papillae anales broken in the only known female.) Apophyses anteriores distinctly shorter and stouter than posteriores. Sterigma a rather narrow area of denser sclerotization, without special structures. Ductus narrow for posterior third, then widen-

ing. Corpus bursae broader than long, its wall membranous. The specimen is excluded from the type series since there is some doubt of its conspecificity with the male. The locality differs from that of the male holotype, and there are no other specimens of this species.

This new species is named in honour of Mario Boza, Viceminister of the Costa Rican Ministry of Natural Resources, Energy and Mines, in recognition of his outstanding promotion of Costa Rica's national park and wildland conservation for more than two decades.

MATERIAL EXAMINED.
Holotype ♂, [**Ecuador**]: West Ecuador, Hacienda Ave Maria (*Buchwald*); Rothschild Bequest B.M. 1939-1 (genitalia slide No. 14358; BMNH).

Paratype. **Ecuador**: 1♂, Equateur, Chimbo (*Mathan*), 1er Semestre 1892; Ex Oberthür Coll. Brit. Mus. 1927-3 (genitalia slide No. 13693; BMNH).

Perissopteryx trinidadicola sp.n.

(Figs 87, 88, 145, 176)

♂ (Fig. 87), ♀ (Fig. 88). Small and fairly robust. Both wings ochreous-grey to sand-coloured, and then with only rather faint grey striation. Fore wing with lines complete; median line well developed, subbasal and postmedian lines faint or well developed. Apical blotch very weak, discal spots small. Hind wing with median line faint. Underside whitish grey, with sharply contrasting, dark grey terminal shade. Median lines of both wings and discal spots on fore wings clearly discernible, apical blotch hardly visible. Dorsal aspect of thorax and abdomen concolorous with wings. Abdomen without coremata. Fore wing length: ♂ 13 mm; ♀ 14 mm.

GENITALIA ♂ (Fig. 145). In ventral view, genital capsule less elongated than in its congeners. Uncus strong, broad at base, not spindle-shaped. Socii small. Tegumen hardly longer than vinculum, robust, narrowing only very slightly towards uncus. Vinculum strongly rectangular ventrally, the tip well defined. Aedeagus with a fairly massive median cornutus (pointed process long), and with apical cornuti in a long row.

GENITALIA ♀ (Fig. 176). Papillae anales slightly pointed. Apophyses posteriores nearly twice as long as anteriores. Sterigma large. Ductus bursae very long and coiled, well sclerotized. Corpus bursae small and rounded.

DIAGNOSIS. *P. trinidadicola* is a small and rather robust species. In externals, the species is difficult to distinguish from *gamezi* and *divisaria*. However, two of the three specimens known for *trinidadicola* are less grey and more sand-coloured than in *gamezi* and *divisaria*. The underside is greyish-white and much paler than in *gamezi* or *divisaria*, with a sharply contrasting terminal shade. Since *trinidadicola* is so far known only from the island of Trinidad, distributional data may also prove useful. The genitalia of *trinidadicola* are most similar to those of *divisaria*. In the male, *trinidadicola* lacks the group of strong setae at the base of the inner valval margin and also abdominal coremata. In the female, the sterigma differs in shape, the longitudinal lines in the wall of the ductus bursae are absent, and the corpus bursae is smaller.

DISTRIBUTION. Trinidad.

REMARKS. The name is derived from the country from which it has been collected.

MATERIAL EXAMINED.
Holotype ♂, [**Trinidad**]: W.I., Morne Bleu, Textel Installation At Light 9.xi.1978 (*Cook*); TL-751; CIE COLL A.12521; Pres[ented] by Comm[onwealth] Inst[itute] [of] Ent[omology] B.M. 1980-1; *Thysanopyga divisaria* Walk., 100-64, det. J.D. Holloway 1980 [misidentification] (genitalia slide No. 14288; BMNH).

Paratypes. **Trinidad**: 1♂, 10.vi.-11.vii. (*Kaye*), 1904-25; SC 1 from cell [handwritten] (genitalia slide No. 14372; BMNH); 1♀ (*Kaye*) 1904-14 (genitalia slide No. 14373; BMNH).

Perissopteryx muzonensis sp.n.

(Figs 89, 146)

♂ (Fig. 89). Medium-sized, with rather broad wings. Wings medium brown with very fine grey irrorations and only faint maculation in terminal area of fore wing. Lines complete. Discal spots very small. Apical blotch mostly grey, inconspicuous. Underside grey, dusted with darker scales, terminal shade well developed. Discal spots and apical blotch not visible from beneath. Vestiture of thorax and abdomen concolorous with wings. Fore wing length: 16 mm.

GENITALIA ♂ (Fig. 146). Genital capsule strongly elongated. Uncus stout; socii small. Valva rather narrow and pointed. Tegumen narrow, almost rectangular. Vinculum narrow, rectangular, and more than twice length of tegumen. Juxta large. Aedeagus moderately large, straight with row of minute cornuti near apex; vesica with

angular median cornutus and two subapical cornuti.

GENITALIA ♀. Unknown.

DIAGNOSIS. Externally, this new species is most similar to *bozae* and *smithi*. In the male genitalia, however, it most closely resembles *trinidadicola* and *divisaria*, from which it is best distinguished by the presence of an additional row of very small cornuti on the aedeagus and, especially, by the very long vinculum.

DISTRIBUTION. Known only from Muzo in Colombia, the type locality.

REMARKS. The name is derived from the type locality, Muzo in Colombia. The species is known only from the holotype.

MATERIAL EXAMINED.
Holotype ♂, [**Colombia**]: Muzo, 400-800 m (*Fassl*); L.B. Prout Coll. B.M. 1939-643 (genitalia slide No. 13505; BMNH).

Perissopteryx commendata (Schaus, 1912) **comb. n.**

(Figs 90, 91, 147, 177)

Thysanopyga commendata Schaus, 1912: 425. LECTOTYPE ♂, [COSTA RICA] (NMNH), here designated [examined].

♂ (Fig. 90), ♀ (Fig. 91). Large and robust. Thorax and abdomen mouse-grey in males, ochreous-grey in females. *Male*: ground colour of fore wing mouse-grey, with fine dark striations, especially along the costa. Median line practically absent, subbasal and postmedian lines slightly zigzag, chocolate-brown, bordered with ochreous. Apex with a black spot and a fine, pure white streak. Discal spots off-white with black pupil. Dorsum of fore wing with patch of long hairs along anal margin. Hind wing grey-brown with dark striations and a darker terminal shade. Median line present. Discal spot visible on fore wing. Large hair-patches on dorsum of fore wing also visible. *Female*: ground colour of fore wing lighter grey than in males, mixed with ochreous, and with fine, dark striations; subbasal line and most of postmedian area of fore wing rich chocolate-brown. Hind wing: median line absent. Underside: without discal spots; terminal shade better developed than in males. Fore wing length: ♂ 16 mm; ♀ 16-17 mm.

GENITALIA ♂ (Fig. 147). Uncus moderately large, socii large. Valva long and narrow, pointed. Vinculum about twice as long as tegumen, widest ventrally; ventrally well-rounded; saccus not developed. Base of vinculum bearing coremata similar to those found in *Thysanopyga*. Aedeagus small compared with size of genitalia, with one large median cornutus, deeply cleft, and a patch of more than 20 smaller cornuti.

GENITALIA ♀ (Fig. 177). Papillae anales fairly large. Apophyses posteriores long and slender, anteriores short and stout. Sterigma inconspicuous. Ductus bursae long, its anterior part and the adjoining proximal part of the rounded corpus bursae sclerotized; remaining parts membranous. Corpus bursae with appendix bursae.

DIAGNOSIS. The patch of hairs on the dorsum of the fore wing of the males, together with the presence of tubuliferous genitalia-based coremata and the atypical colour of the wings clearly distinguish this species from its congeners.

DISTRIBUTION. Central America and the adjoining parts of the South American mainland: Panama, Costa Rica, Colombia, and Peru.

MATERIAL EXAMINED (5♂, 2♀).
Lectotype ♂, [**Costa Rica**]: Nov[ember]; Cachi, C[osta] R[ica]; Type No. 17603 U.S.N.M.; *Thysanopyga commendata* Sch[au]s Type [handwritten] (NMNH).

Other material. **Costa Rica**: Juan Vinas, 2500 feet. **Panama**: Volcan de Chiriqui, 3000-4000 feet. **Colombia**: État Cundinamarca, Canache. **Peru**: Yahuarmayo, 1200 feet; Santo Domingo, Carabaya, 6500 feet (BMNH).

Perissopteryx deprivata (Warren, 1909) **comb. n.**

(Figs 92, 148)

Thysanopyga deprivata Warren, 1909: 105. Holotype ♂, PERU (BMNH) [examined].

♂ (Fig. 92). Ground colour of fore wing mouse-grey, finely striated with darker grey. Proximal half of fore wing between subbasal and postmedian line ochreous, subterminal area with or without a large ochreous patch, these areas also striated. Median line grey, its posterior half faint; subbasal line narrow, brown, running towards apex, but not reaching wing margin. Postmedian line brown. Apical blotch ochreous. Discal spot off-white with black pupil. Hind wing ochreous with dark grey striation. Discal spot white, inconspicuous. Underside: lighter ochreous, dusted with grey, especially along costa and termen of fore wing. Discal spot small on fore wing, absent on hind wing. Thorax and abdomen mouse-grey.

Abdomen of males without coremata. Fore wing length: ♂ 14 mm.

GENITALIA ♂ (Fig. 148). Uncus short and stout, with a very small tip; socii fairly large. Valva short, pointed, bearing soft hairs. Juxta approximately triangular. Tegumen U-shaped. Vinculum about 1.3 times length of tegumen, with a prominent ventral plate. Aedeagus small, straight, median cornutus single, flask-shaped, with longitudinal ridges.

GENITALIA ♀. Unknown.

DIAGNOSIS. One of the smallest species of *Perissopteryx*. Confusion may arise over similar small specimens of *nigricomata*. Both species occur in Peru, and may or may not have ochreous markings. However, the males of *deprivata* are clearly identifiable by the prominent basal plate of the vinculum.

DISTRIBUTION. Recorded only from Peru.

MATERIAL EXAMINED.
Holotype ♂, [**Peru**]: Huancabamba, Cerro de Pasco (*Boettger*); Nov. Zool. xvi. 145, *Thysanopyga deprivata* Warren ♂ Type; Rothschild Bequest B.M. 1939-1 (BMNH).

Other material. **Peru**: S.E.Peru, Santo Domingo, 6000 feet (BMNH).

Perissopteryx distincta sp.n.

(Figs 93, 94, 149)

[*Thysanopyga suffecta distincta* Warren, 1909: 106. Described as an aberration.]

♂ (Figs 93, 94). Medium-sized with apex of fore wing pointed. Wings fairly dark (occasionally (Fig. 94) very dark) brown-grey with irregular darker scaling and darker grey maculation in tornal area of fore wing. Fore wing with all three lines narrow, brown, but rather weakly developed. Apical blotch greyish-white, prominent. Discal spots on fore wing large, black. Hind wing with median and postmedian line appearing only as indistinct fasciae. Discal spot white. Underside: paler grey-brown with intense grey irroration. Fore wing with discal spot and apical blotch just visible. Terminal shade absent from hind wing, weakly developed on fore wing. Basal half of hind wing with patch of ochreous hairs. Abdomen of males without coremata. Fore wing length: ♂ 16-17 mm.

GENITALIA ♂ (Fig. 149). Uncus short and stout; socii moderately large. Valva short and comparatively broad. Juxta broadly trapezoidal. Vinculum about twice as long and much broader than tegumen. Tegumen narrow with a large and rounded basal plate. Membranous parts of vinculum forming a large sac, bearing long hairs. Aedeagus with a single, needle-like median cornutus.

GENITALIA ♀. Unknown.

DIAGNOSIS. The adult moth resembles *nigricomata*, which, although usually smaller, may attain the same size. The apex of the fore wing of *distincta* is more acutely pointed. Both species are sympatric in Peru. In the male genitalia, *distincta* may be distinguished from *nigricomata* by its much larger and ventrally well rounded vinculum, the absence of a tooth-like projection on the inner valval margin, and the trapezoidal, not triangular, juxta.

DISTRIBUTION. Known only from Peru.

REMARKS. Originally, Warren (1909: 105) described *distincta* as an aberration of *Thysanopyga suffecta*. Being infrasubspecific, the provisions of the International Code do not apply to Warren's taxon. However, the name is still available and we have made Warren's 'type' of the aberration the holotype of *distincta*.

MATERIAL EXAMINED.
Holotype ♂, [**Peru**]: Cushi, Huanuco, 1900 m (*Hoffmanns*); *Thysanopyga suffecta* ab.*distincta* Warren ♂ type [upperside]; *Thysanopyga suffecta distincta* Warr. XVI.104 [underside] [handwritten]; Rothschild Bequest B.M. 1939-1 (genitalia slide No. 13662; BMNH).

Paratypes. 12♂, data as holotype, but without handwritten 'type' label (genitalia slides Nos 13619, 13620; BMNH); **Peru**: 1♂, Cushi, Huanuco, 820 m (*Hoffmanns*); Rothschild Bequest B.M. 1939- 1 (genitalia slide No. 13509; BMNH); 1♂, Cushi, Huanuco, 1820 m, 1904 (*Hoffmanns*); Rothschild Bequest B.M. 1939-1; 2♂, Pozuzu, 5000-6000 f[ee]t, (*Native Collector*); Joicey Bequest Brit. Mus. 1934-120; 1♂, Huancabamba, Cerro de Pasco (*Boettger*); Rothschild Bequest B.M. 1939-1.; 1♂, Oxabamba, Junim; L.B. Prout Coll. B.M. 1939-643 (genitalia slide No. 14732; BMNH).

Perissopteryx nigricomata (Warren, 1901) comb. n.

(Figs 95-100, 150, 178)

Thysanopyga nigricomata Warren, 1901: 481. Holotype ♂, [PANAMA: Chiriqui] (BMNH) [examined].
Thysanopyga muricolor Schaus, 1911: 595. LEC-

TOTYPE ♂, COSTA RICA (NMNH), here designated [examined]. **Syn. n.**

♂ (Figs 95, 96, 99), ♀ (Figs 97, 98, 100). Male small to medium-sized, female smaller. Fore wing: median area cinereous to mouse-grey, with darker striations; basal and postmedian area darker, grey-brown with grey maculation; some specimens with broad ochreous streak along costal margin, and with ochreous maculation in terminal area of fore wing; median line on fore wing weak; subbasal and postmedian lines better developed; discal spot black, usually normal, sometimes small; apical blotch cinereous, conspicuous. Hind wing: ochreous to mouse-grey, with darker striations; discal spots minute, white; median line at most weakly developed, often absent. Occasionally, extensive ochreous markings present on both wings (Fig. 96). Underside: dull grey dusted with darker scales; terminal shade present; discal spots present on fore wing; apical blotch appearing as lighter area in terminal shade of fore wing. Thorax and abdomen mouse-grey. Abdomen of males without coremata. Fore wing length: ♂ 15-16 mm; ♀ 12-17 mm.

GENITALIA ♂ (Fig. 150). Uncus stout, with only a small apical hook; socii small. Valva rather broad, with a tooth-like process at inner margin; inserting directly on sclerotized parts of vinculum (not on the membranous central parts). Juxta triangular. Vinculum narrow, with a large basal plate and a small membranous sac, bearing sparse hairs. Aedeagus with a single, flask-shaped median cornutus, and a group of approximately ten smaller cornuti.

GENITALIA ♀ (Fig. 178). Papillae anales fairly long. Both pairs of apophyses short and slender. Sterigma distinct. Ductus bursae broad, gradually widening into elongate corpus; appendix bursae present.

DIAGNOSIS. This species varies considerably in size, particularly in females. The variation is similar to that observed in *distincta*, and darker specimens, in particular, are similar. However, in *nigricomata* the fore wing apex is less pointed. Males of *nigricomata*, like those of *distincta*, possess a patch of yellowish hair on the underside of the hind wing. Small specimens with ochreous maculation may be confused with *deprivata*. The differences in the male genitalia are given in the diagnosis for that species.

DISTRIBUTION. Recorded from Costa Rica, Panama, Colombia, Bolivia, and Peru.

MATERIAL EXAMINED (6♂, 3♀).

Holotype ♂ (*nigricomata*); **Panama**: N.Z. viii. p. 481, *Thysanopyga nigricomata* Warren ♂ Type; Rothschild Bequest B.M. 1939-1 (BMNH).

Lectotype ♂, [**Costa Rica**]: Juan Vinas; June; Type No. 17454 U.S.N.M.; *Thysanopyga muricolor* Sch[au]s Type [handwritten] (NMNH) [examined]. Paralectotype ♀, **Costa Rica**: Juan Vinas; June, Schaus and Barnes coll.; *Thysanopyga muricolor* Sch[au]s ♀ type [handwritten] (NMNH).

Other material. **Costa Rica**: Orosi, 1200 m. **Colombia**: Monte Tolima, Colombian Central Cordillera, 3200 m. **Bolivia**: Cochabamba, Yunga del Espirito Santo; Rio Songo, 750 m. **Peru**: Oxayampa; Province Huanuco, Cushi, 1900 m; Santo Domingo, Carabaya, 6500 feet (BMNH).

Perissopteryx albopunctaria (Dognin, 1900) **comb. n.**

(Figs 101, 151)

Thysanopyga albopunctaria Dognin, 1900: 450. Holotype ♂, [ECUADOR] (NMNH) [examined].

♂ (Fig. 101). Medium-sized, pastel-shaded with acutely pointed fore wing and indistinct lines. Fore wing mouse-grey with large ochreous areas, especially in basal half and along costa; thinly striated with grey; all three lines relatively straight, brown, but not clearly defined; discal spot large, white; apical blotch inconspicuous and nearly concolorous with wing. Hind wing lighter, whitish-ochreous with grey striations and three broad lines (more like fasciae) of same colour; discal spots also white. Underside greyish ochreous, with fine darker scaling, becoming more intense towards termen. Apical region of fore wing darker brown, with apical blotch appearing as a greyish-white area. Discal spots absent. Basal half of hind wing with a patch of ochreous hairs. Thorax and abdomen mouse-grey. Abdomen of male without coremata. Fore wing length: 16 mm.

GENITALIA ♂ (Fig. 151). Elongated. Uncus short and stout, with apical hook minute; socii rather large. Valva short and narrow. Tegumen short, nearly rectangular. Juxta large. Vinculum more than twice length of tegumen, delicate and mostly membranous except for the sclerotized frame. Basal region occupied by a weak tip. Aedeagus almost straight, equalling genital capsule in length; single cornutus, rather weakly sclerotized, bearing longitudinal ridges.

GENITALIA ♀. Unknown.

DIAGNOSIS. Attains the size of *P. distincta* and has similarly pointed fore wings, but is distinguished by its pastel shade and the presence of white discal spots on all wings.

DISTRIBUTION. Known only from the type locality, El Monje, southern Ecuador.

MATERIAL EXAMINED.
Holotype ♂, **Ecuador**: El Monje, près Loja, Equateur, 1893; n.sp.? [undecipherable] 1900; *Thysanopyga albopunctaria* Dgn. type ♂; Dognin Collection; Type No. 31623 U.S.N.M. (NMNH).

APPENDIX 1

Listed below are those species previously assigned, at some time in their taxonomic history, to *Thysanopyga* (or its junior synonym, *Pachydia*), which are here excluded from that genus. The list is likely to be incomplete, but we feel that included in it are most of the species likely to be encountered by anyone working on the genus.

longistria Warren
fractimacula Warren
fulvifascia Warren
nicetaria (Guenée)
cercyon Druce
cermala Druce
oraea Druce
oroanda Druce
maresa Schaus
nigristicta (Warren)
crenata Herbulot
puatartia Dyar
bipunctifera Dognin
brunneonotata Warren
brunnescens Dognin
casperia Druce
subalba Warren
fuscaria Schaus
palliata Warren
lollia Schaus
cermalodes Dognin
intractata (Walker)
proditata (Walker)
gausaparia Grote, 1881
fulva Warren, 1900

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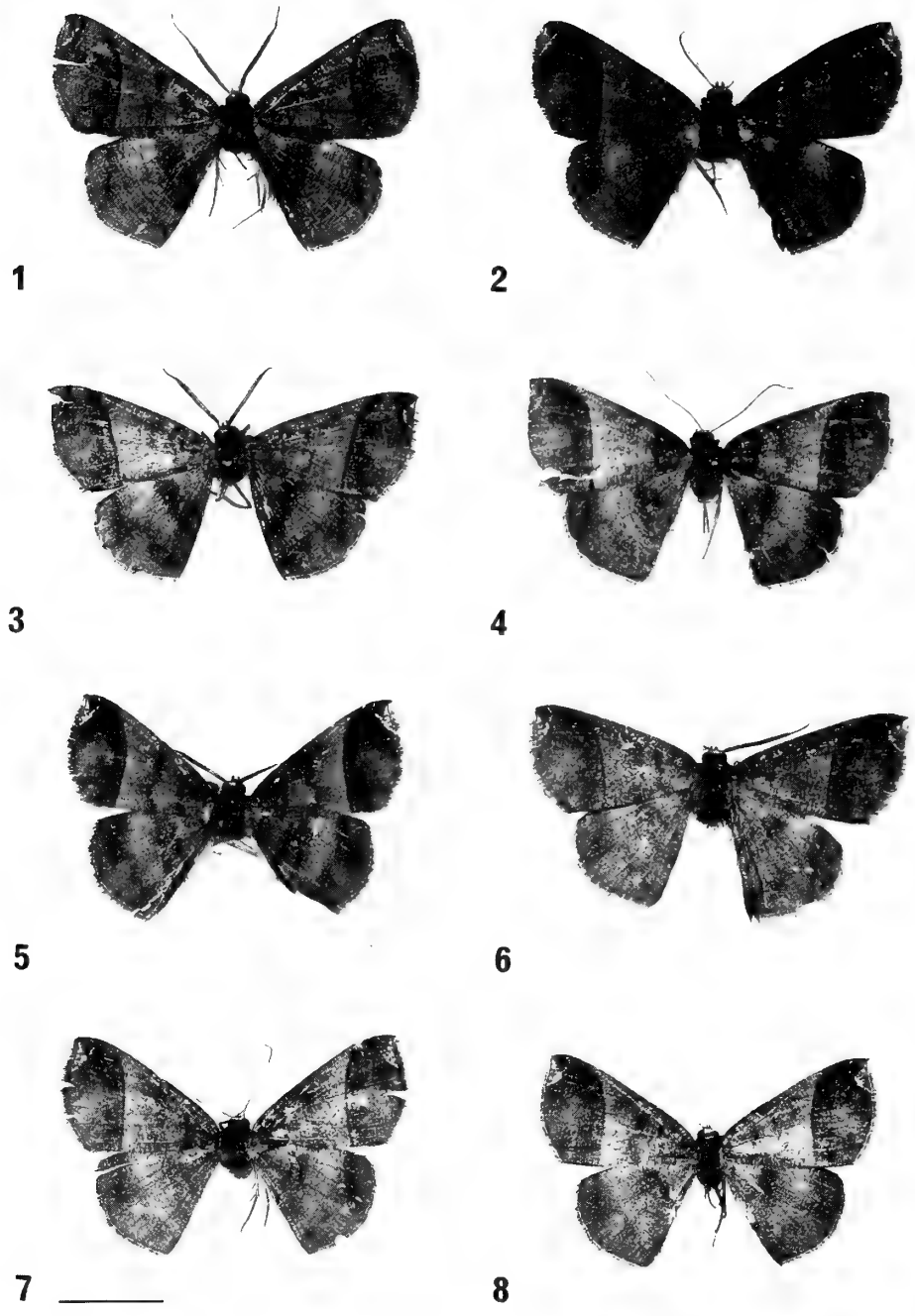
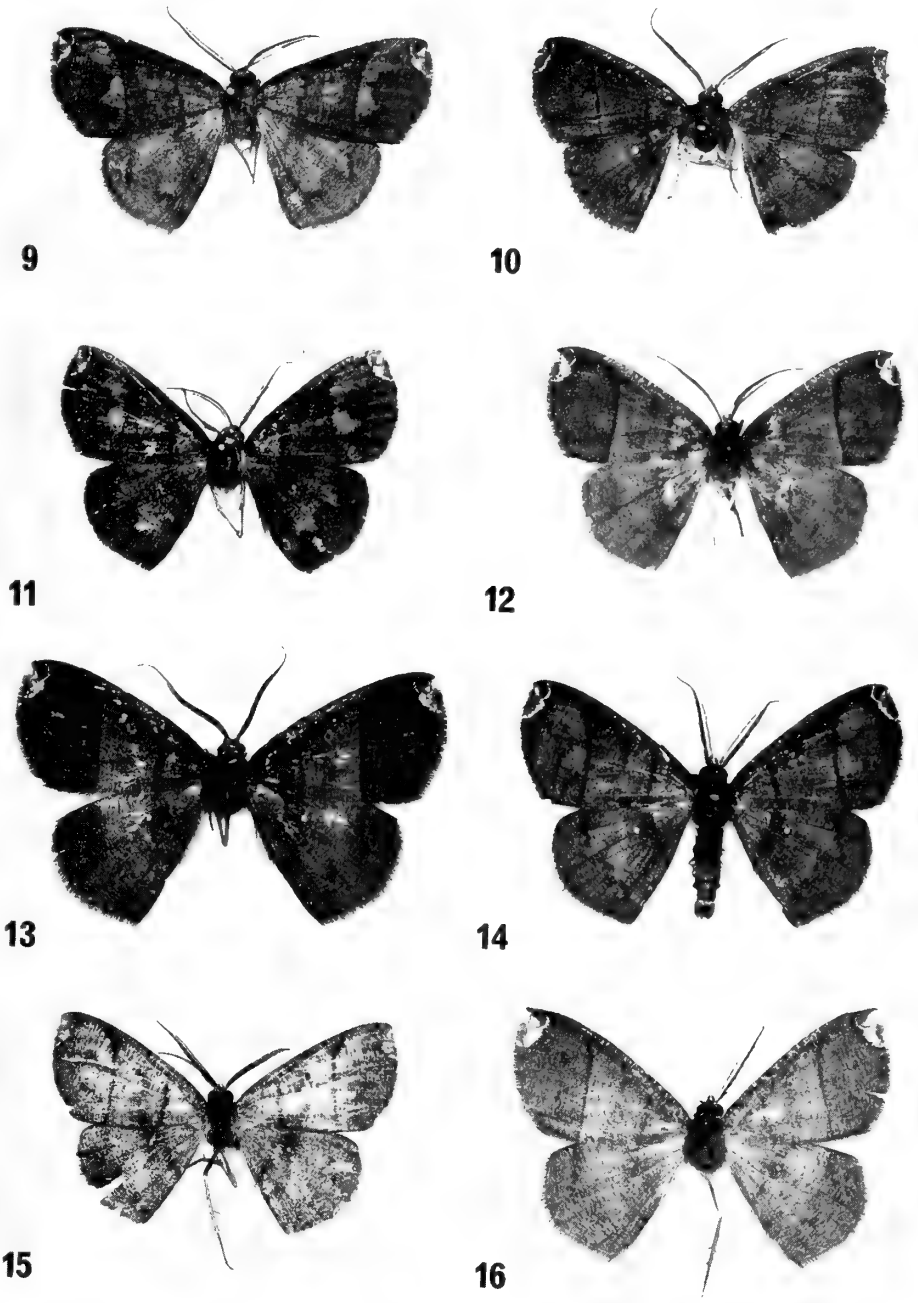
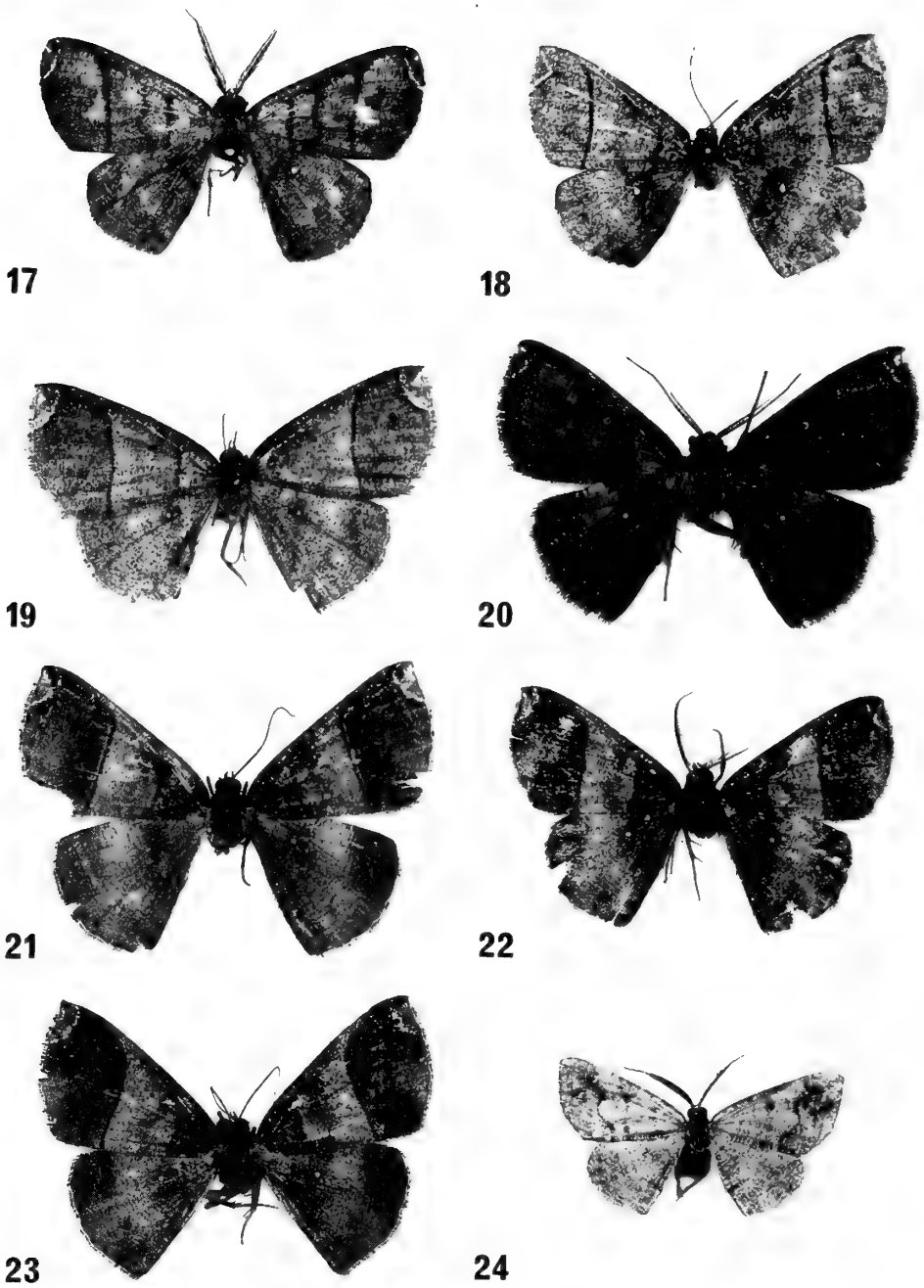


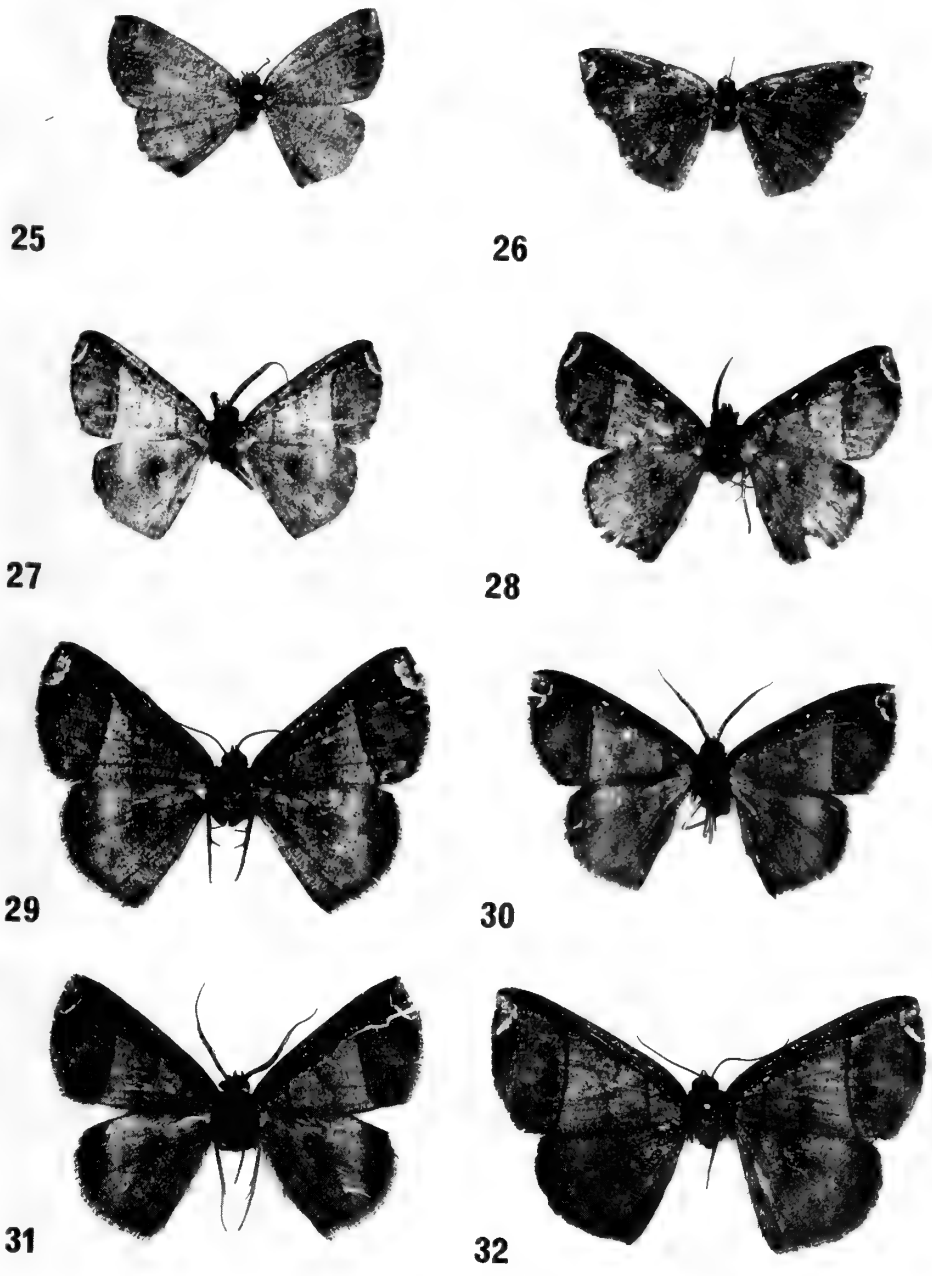
Figs 1–8 *Thysanopyga* species. 1–4, *T. apicitruncaria*; 1–3, males; 4, female. 5–8, *T. abdominaria*; 5, 6, males; 7, 8, females. Scale line: 10 mm.



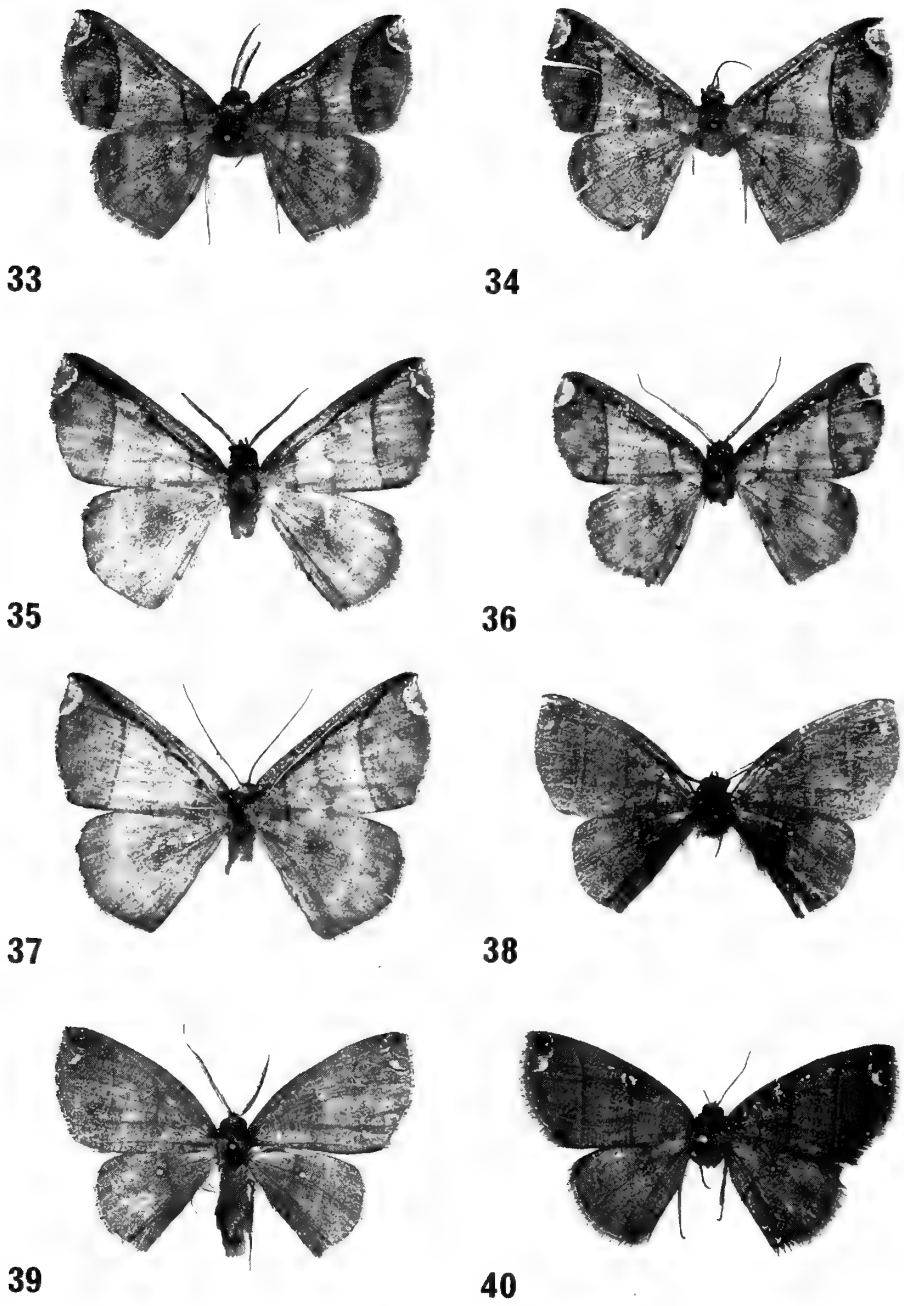
Figs 9–16 *Thysanopyga* species. 9–11, *T. pygaria*, males. 12–16, *T. amarantha*, males. Scale as Figs 1–8.



Figs 17–24 *Thysanopyga* species. 17–19, *T. amarantha*; 17, male; 18, 19, females. 20, 21, *T. henneickeae* (paratypes); 20, male; 21, female. 22, 23, *T. gauldi* (paratypes); 22, male; 23, female. 24, *T. strigata* (holotype, male). Scale as Figs 1–8.



Figs 25–32 *Thysanopyga* species. 25, *T. strigata*, female. 26, *T. prunicolor* (holotype, female). 27–29, *T. carfinia*; 27, 28, males; 29, female. 30–32, *T. nigricosta*; 30, 31, males; 32, female. Scale as Figs 1–8.



Figs 33–40 *Thysanopyga* and *Perissopteryx* species. 33, 34, *T. olivescens*; 33, holotype, male; 34, paratype, female; 35–37, *T. janzeni*; 35, holotype, male; 36, paratype, male; 37, paratype, female; 38–40, *P. delusa*; 38, 39, males; 40, female. Scale as Figs 1–8.

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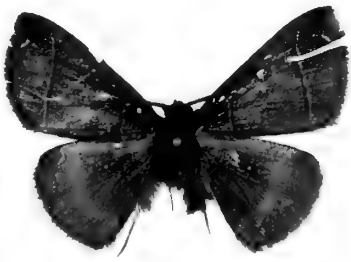

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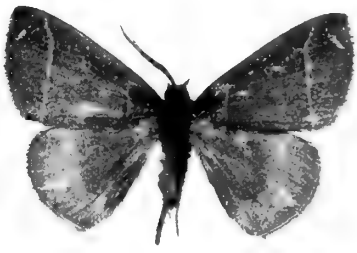

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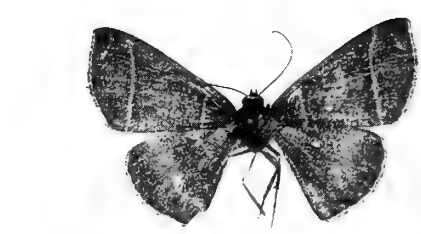
Figs 41–48 *Perissopteryx* species. 41, *P. delusa*, female; 42, *P. fletcheri* (holotype, male). 43, *P. huanucoi* (holotype, male). 44–48, *P. griseobarbipes*; 44, holotype, male; 45, 46, male paratypes; 47, 48, female paratypes. Scale as Figs 1–8.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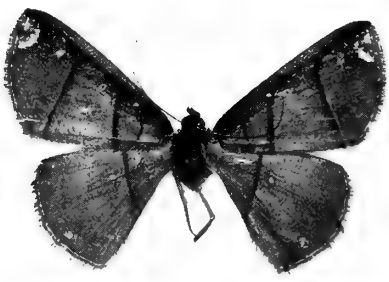
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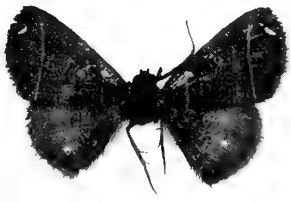
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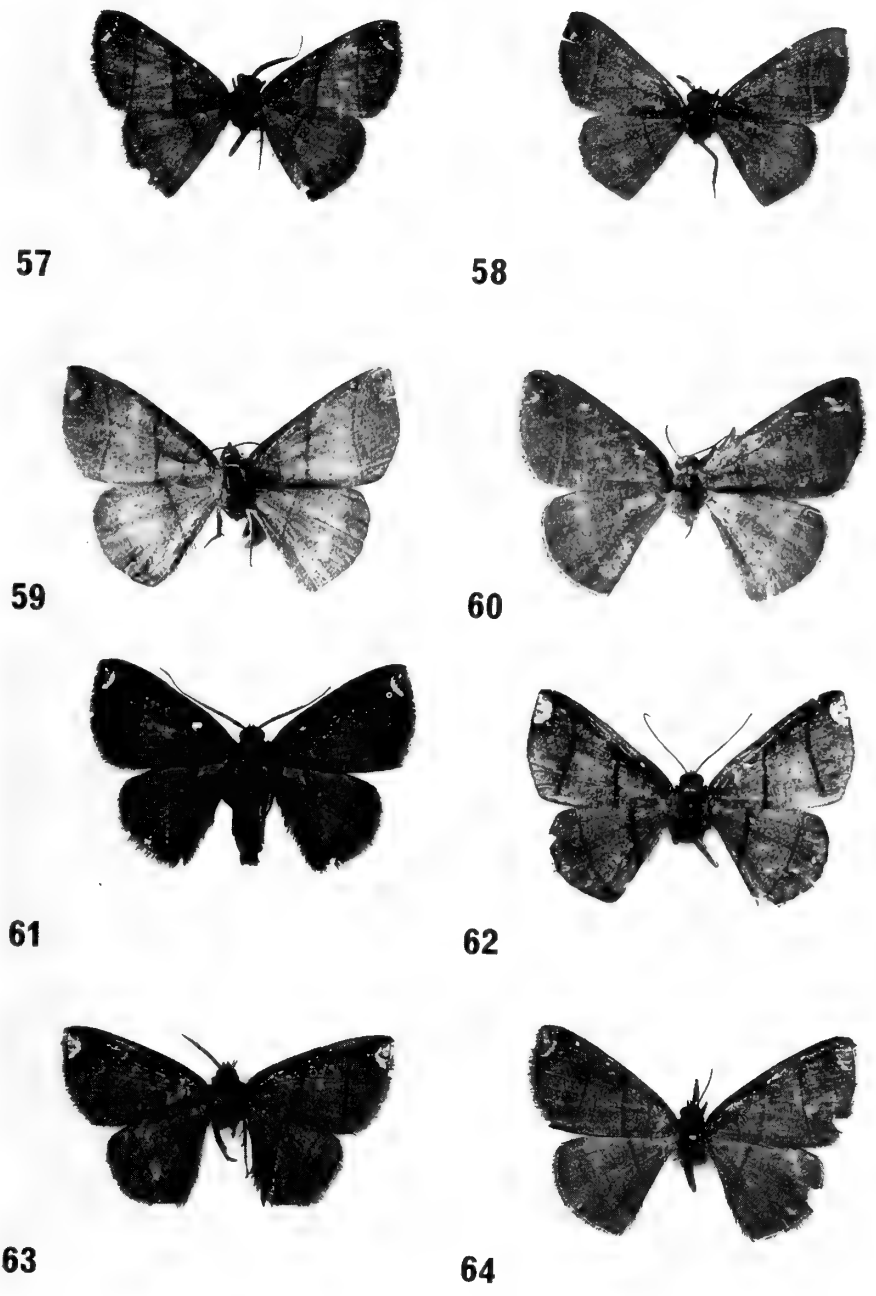
Figs 49–56 *Perissopteryx* species. 49, *P. griseobarbipes* (paratype, female). 50–53, *P. ochreobarbipes* (paratypes); 50, 51, males; 52, 53, females. 54–56, *P. ugaldei*; 54, holotype, male; 55, paratype, male; 56, paratype, female. Scale as Figs 1–8.



Figs 57–64 *Perissopteryx* species. 57–60, *P. neougaldei*; 57, holotype, male; 58, paratype, male; 59, 60, females. 61, 62, *P. submarginata*; 61, male; 62, female. 63, 64, *P. submarginatella* (paratypes); 63; male; 64, female. Scale as Figs 1–8.

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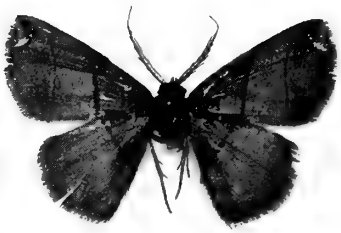

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Figs 65–72 *Perissopteryx* species. 65–68, *P. ochrilinea*; 65, paralectotype, male; 66, male; 67, 68, females. 69–72, *P. gamezi*; 69, holotype, male; 70, 71, male paratypes; 72, paratype, female. Scale as Figs 1–8.

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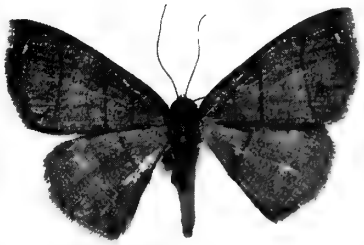

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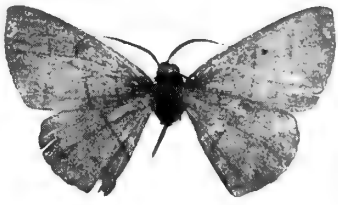

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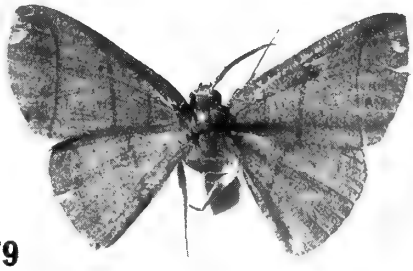

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Figs 73–80 *Perissopteryx* species. 73–75, *P. raveni* (paratypes); 73, 74, males; 75, female. 76–77, *P. suffecta*; 76, holotype, male; 77, female. 78, *P. intermedia* (holotype, male). 79, 80, *P. smithi*; 79, holotype, male; 80, paratype, female. Scale as Figs 1–8.

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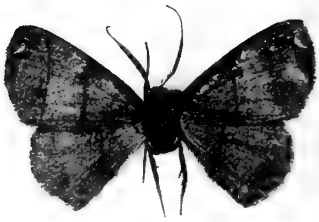

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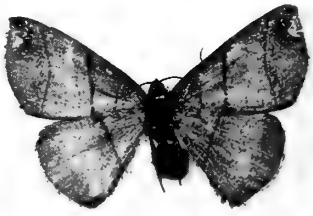

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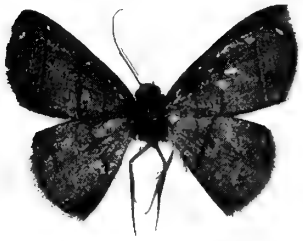

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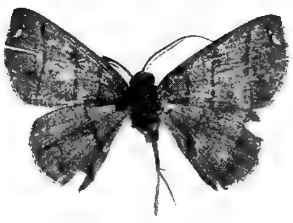

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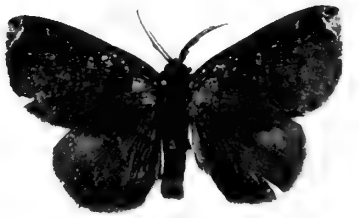

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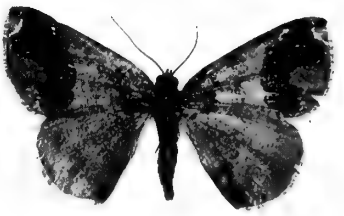

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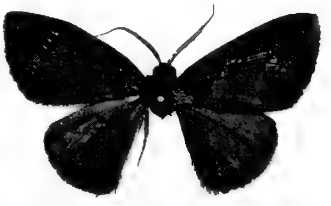

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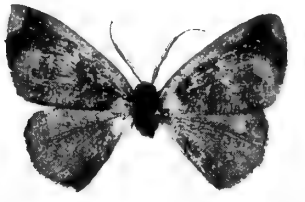

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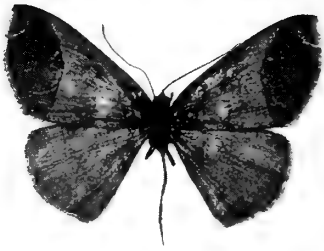

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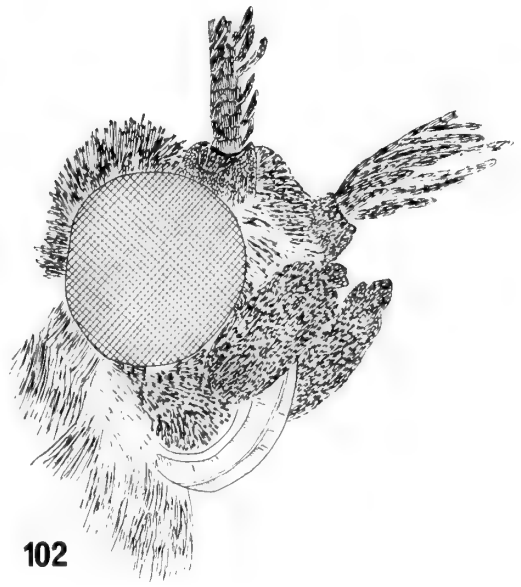

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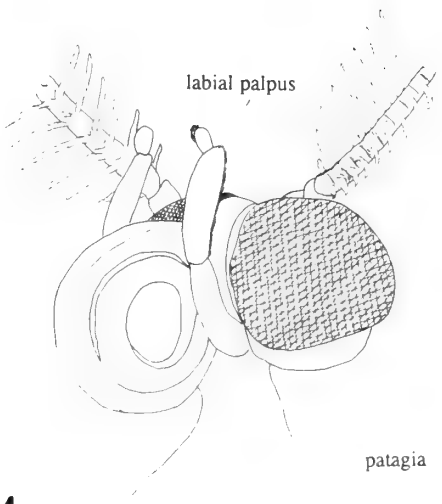

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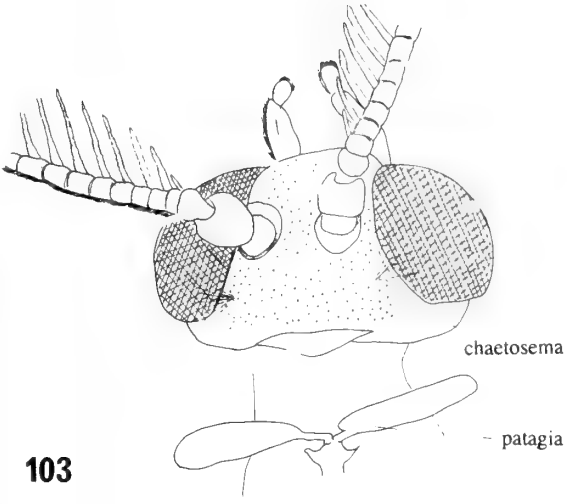

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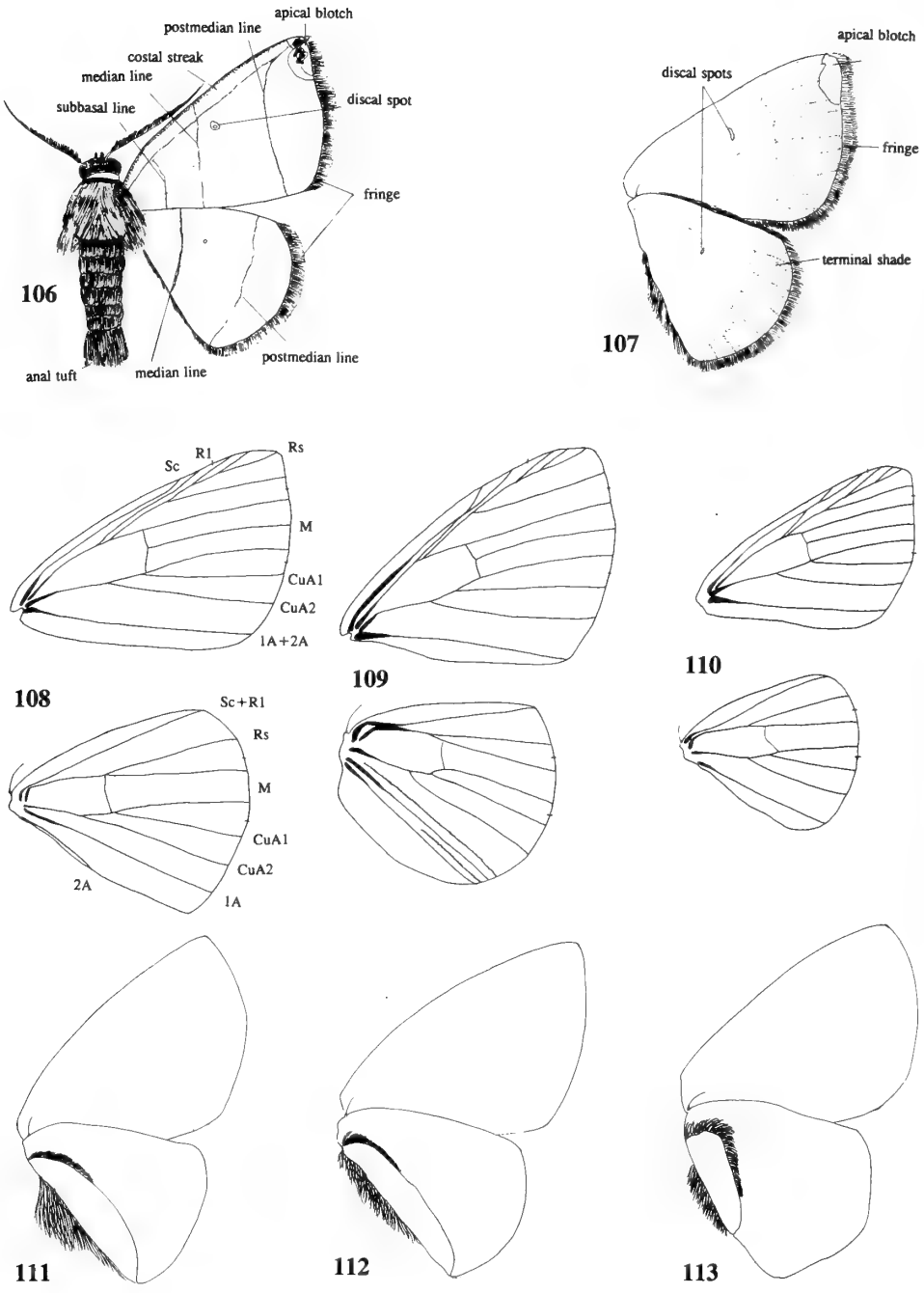

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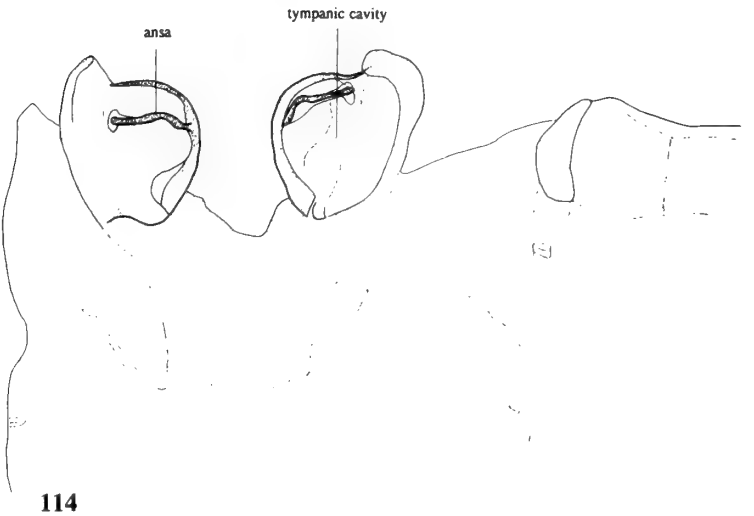

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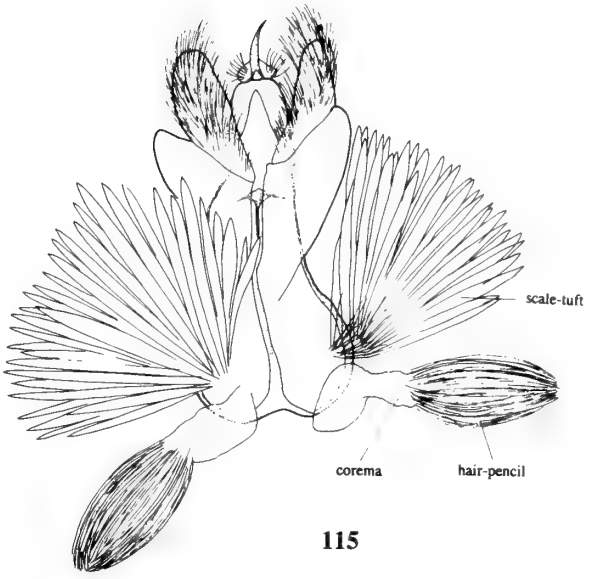

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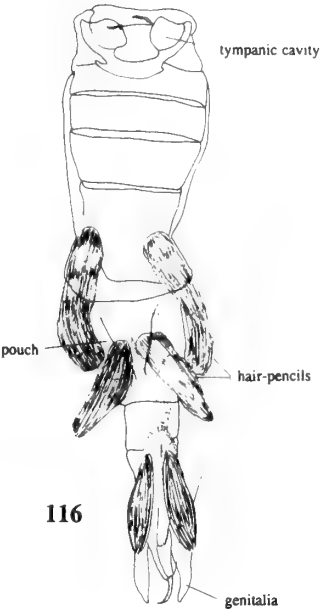

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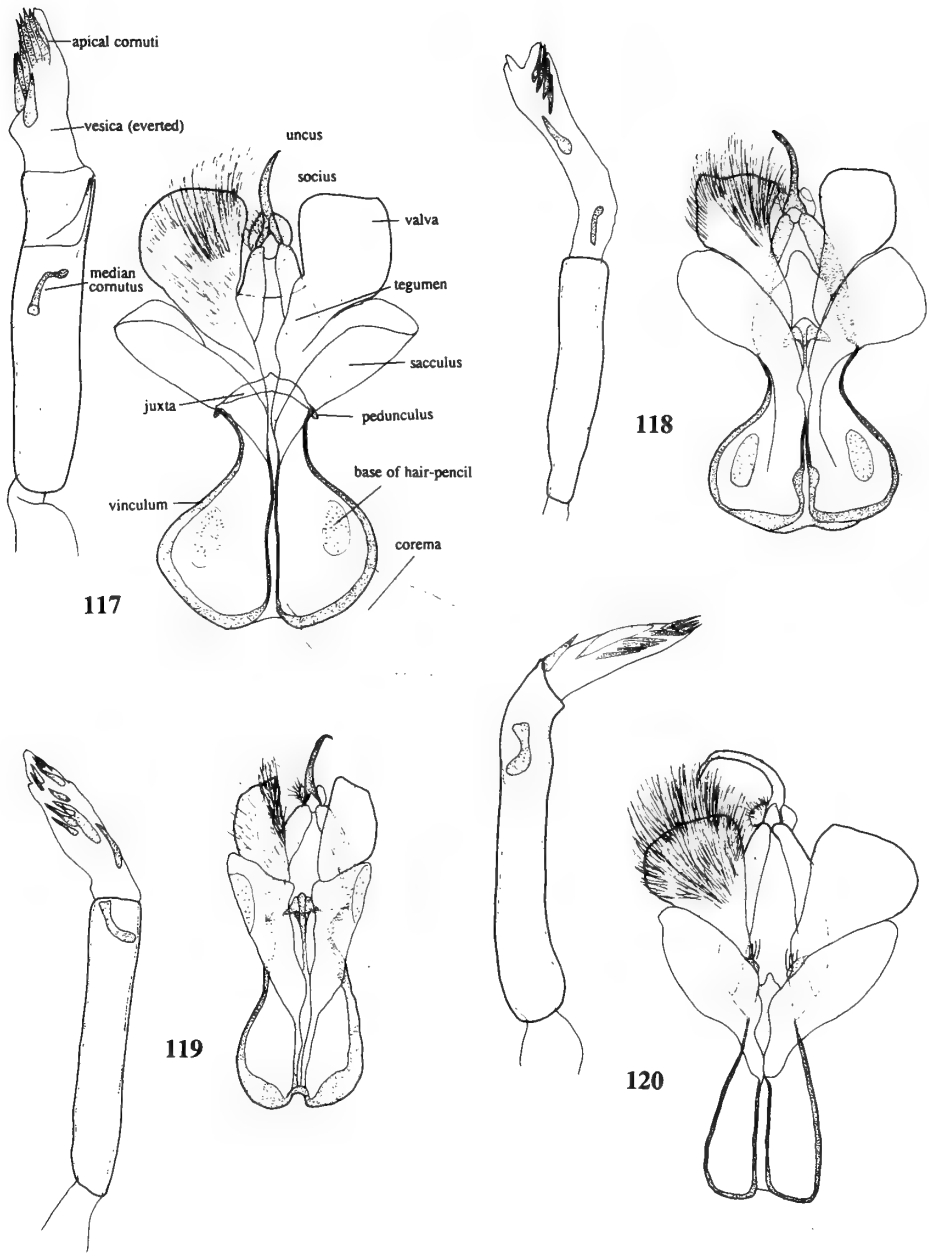

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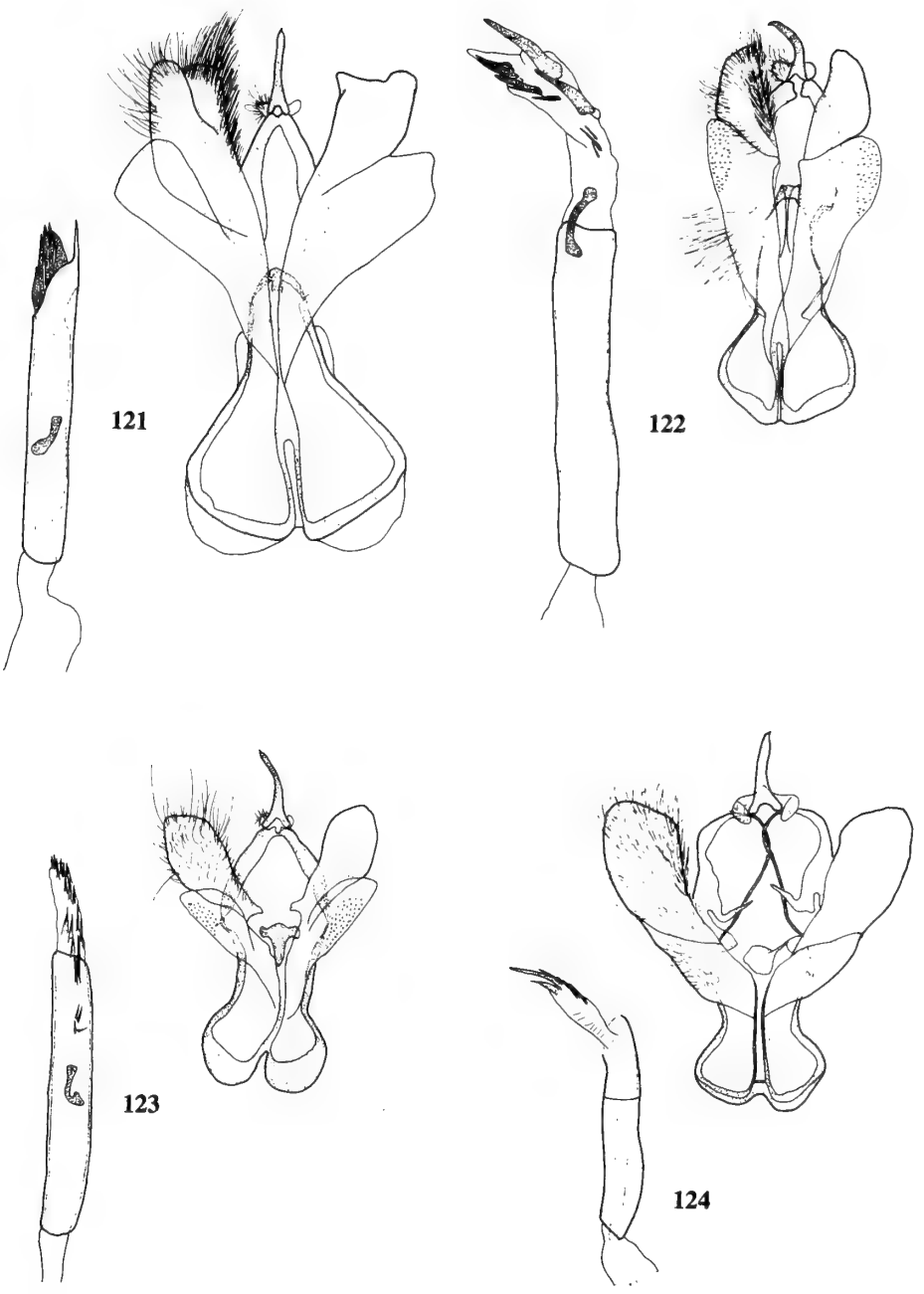

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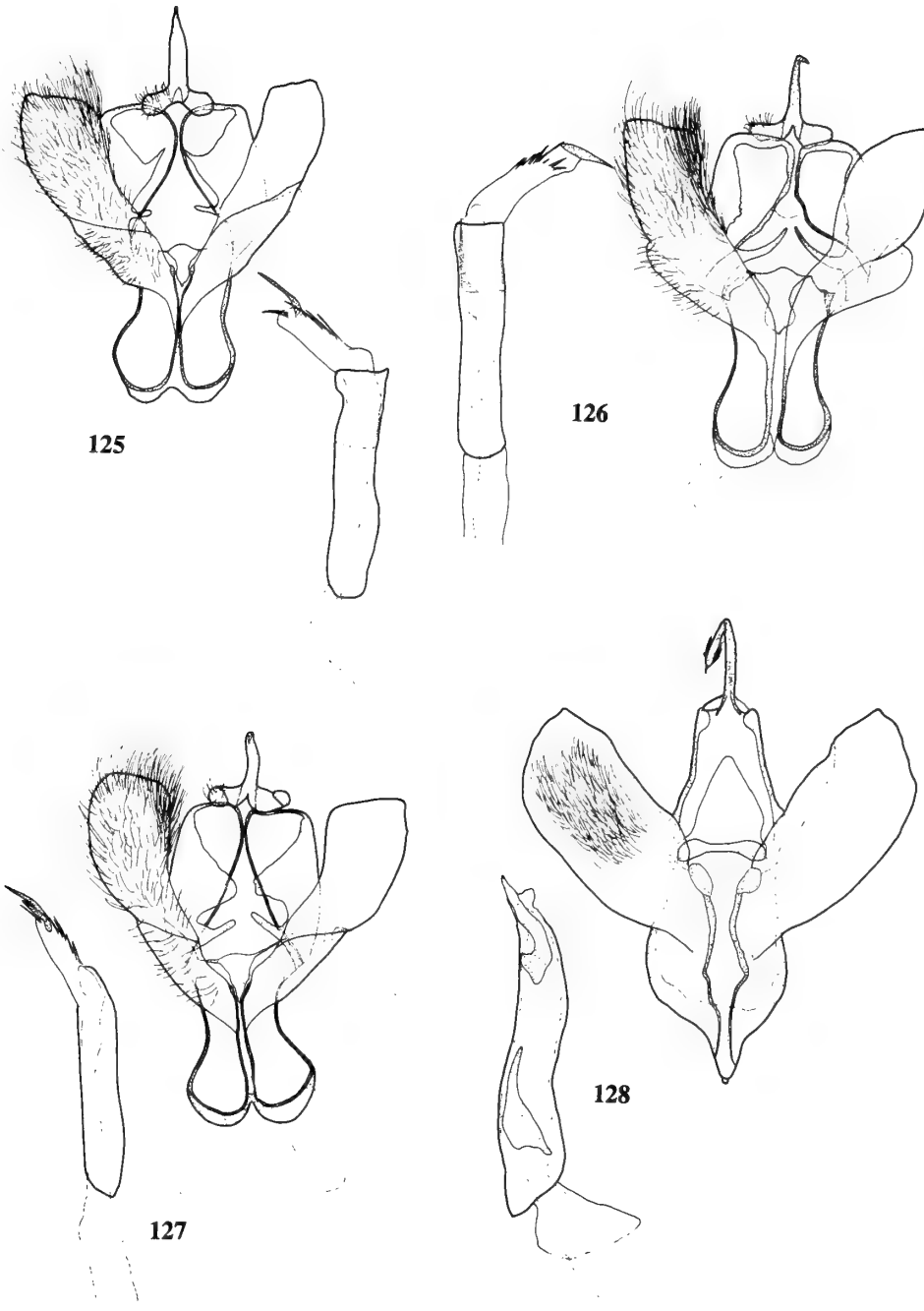

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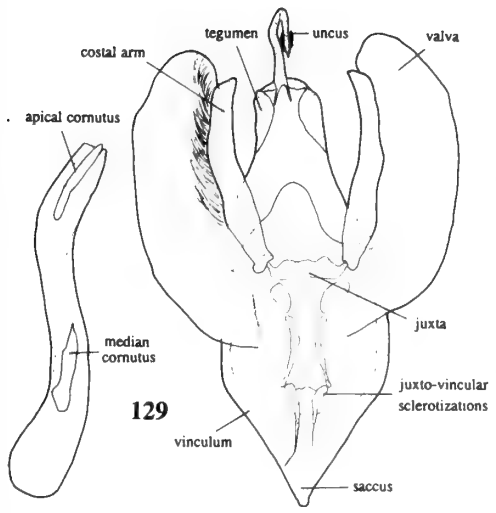

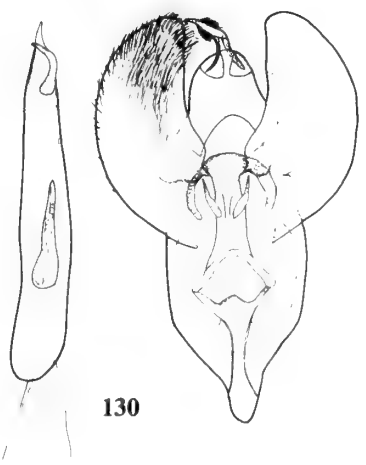

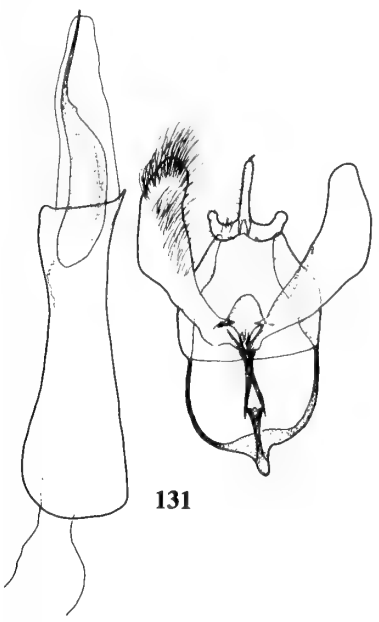

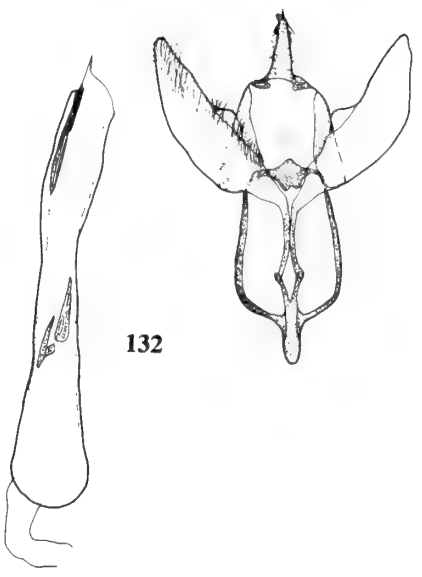

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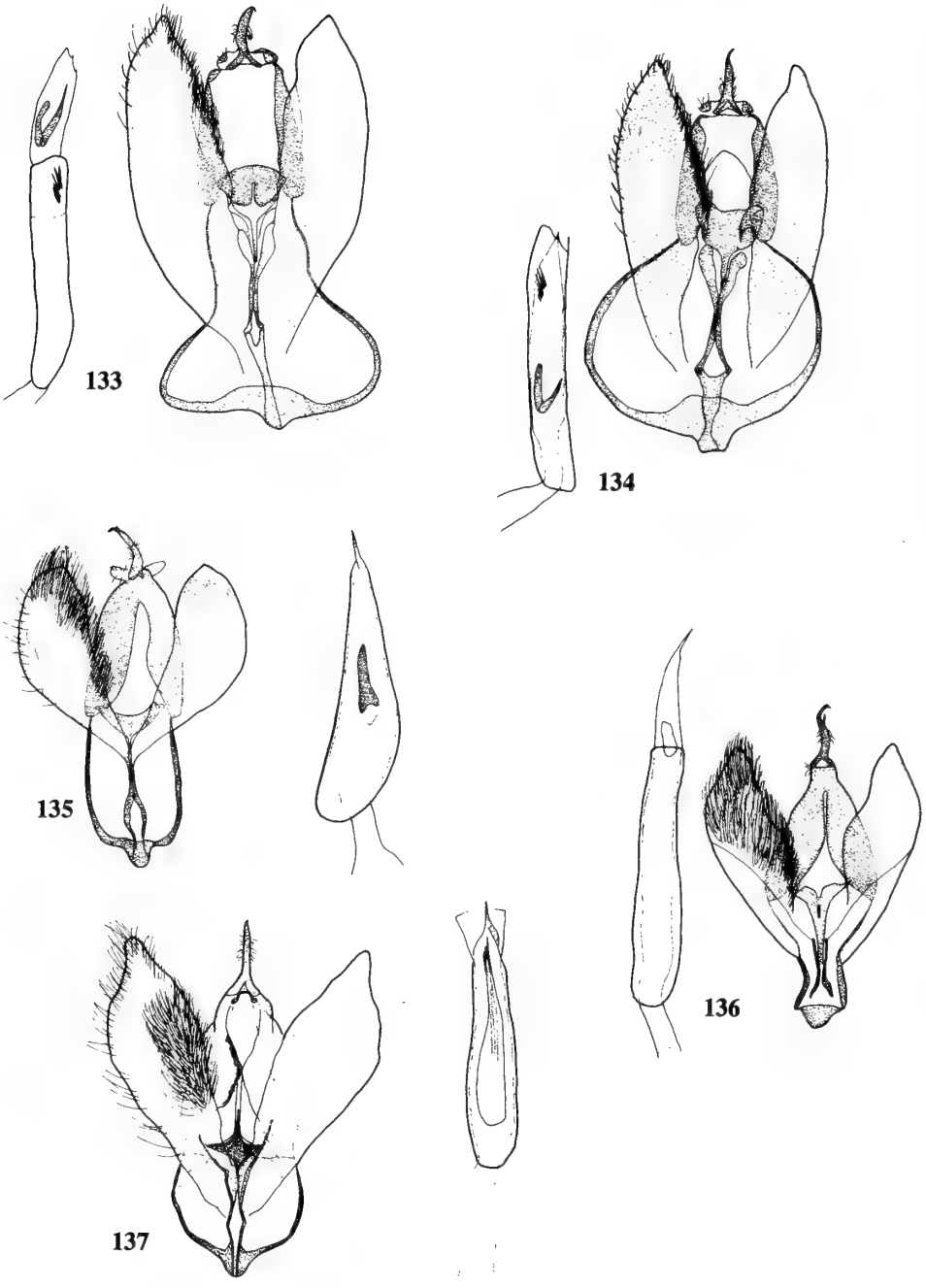

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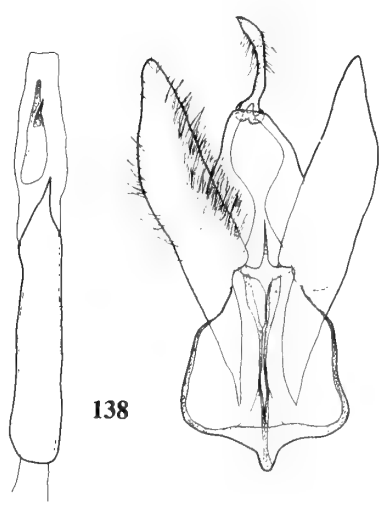

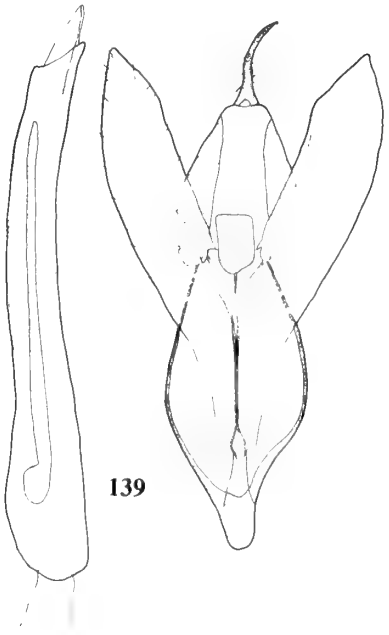

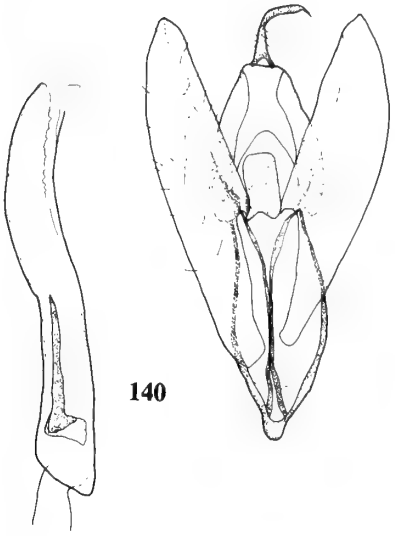

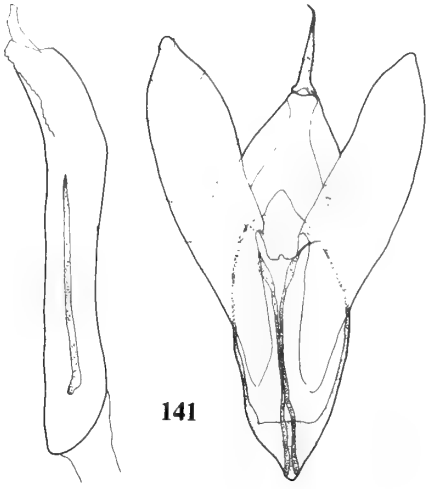

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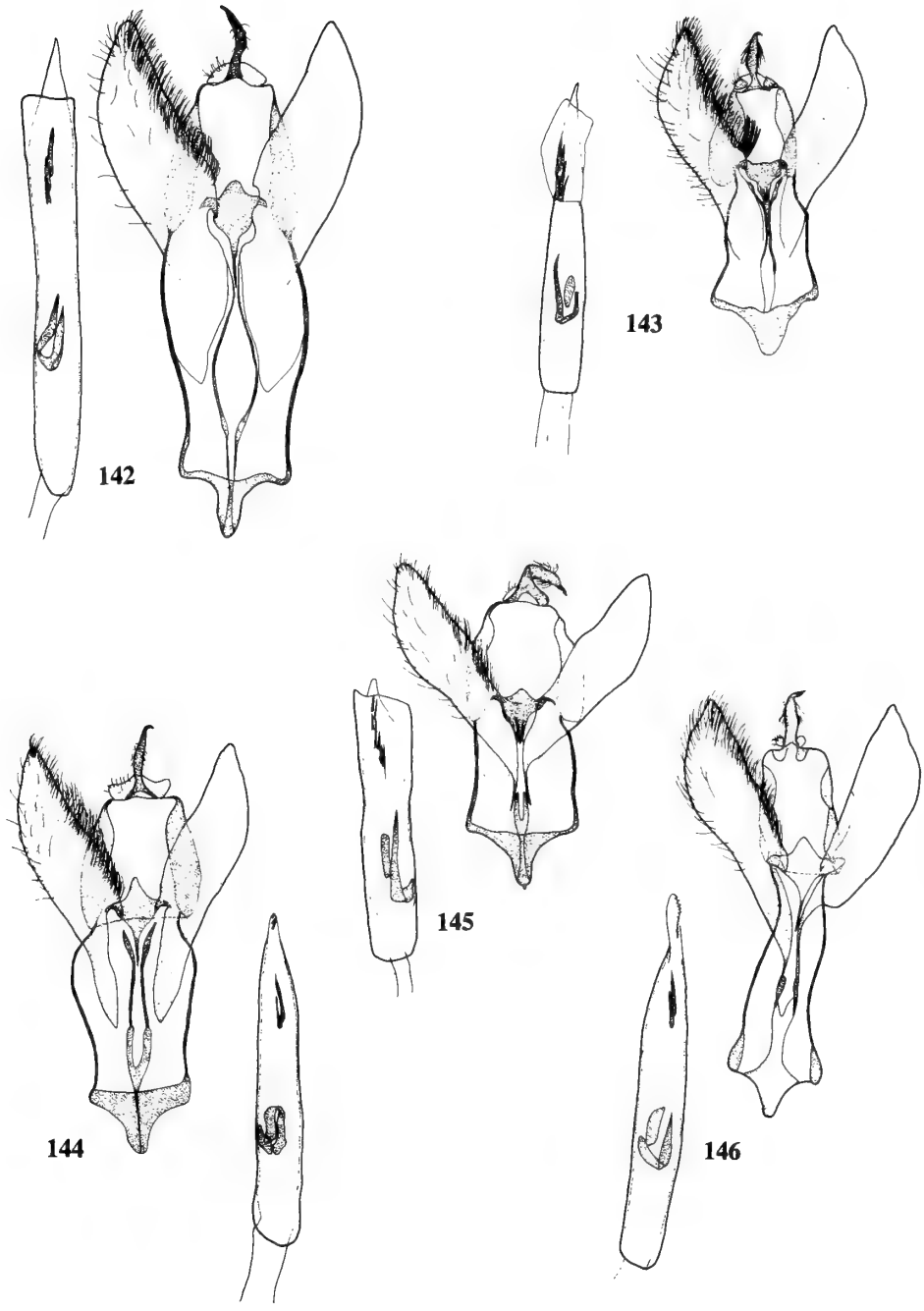

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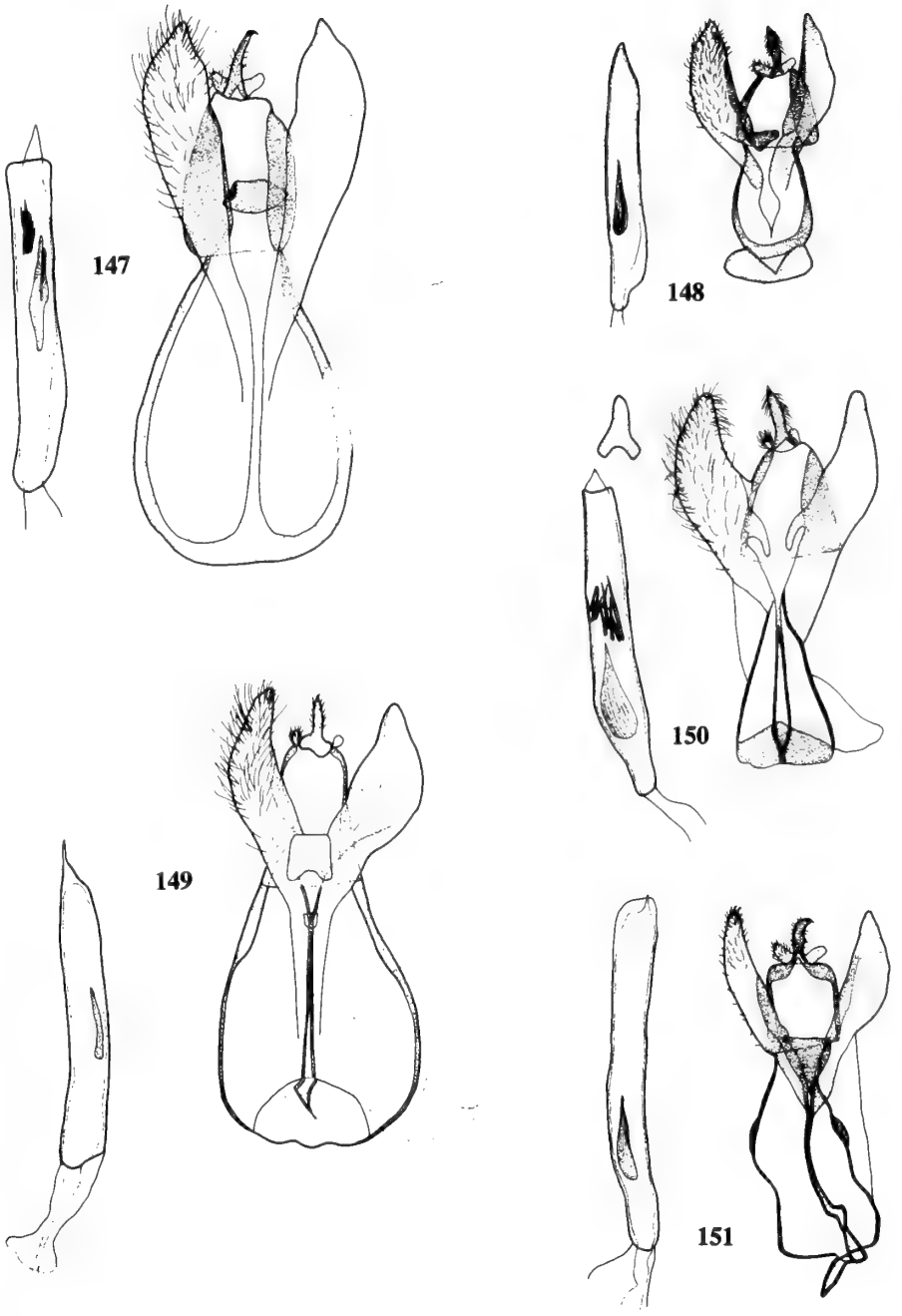

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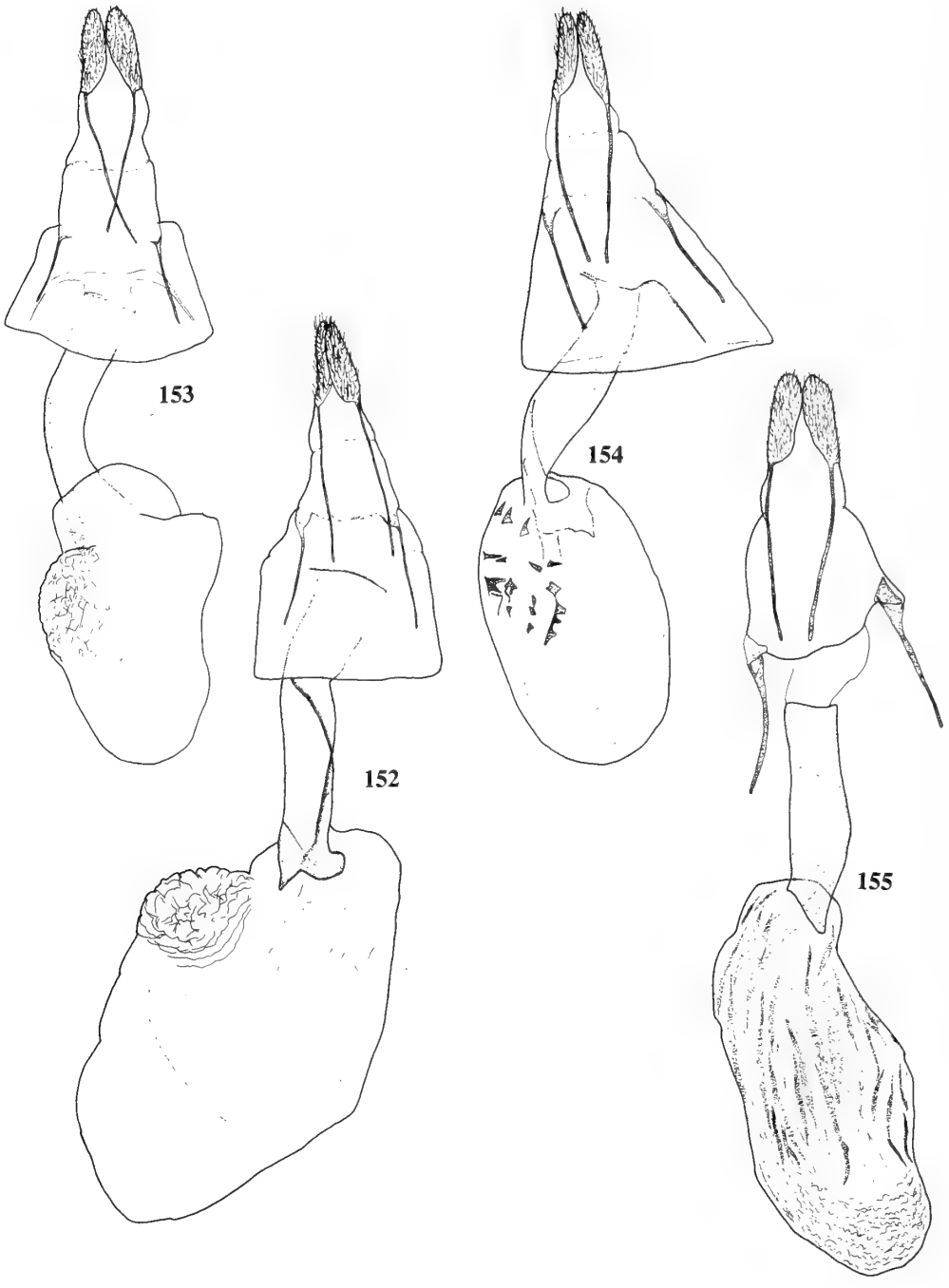

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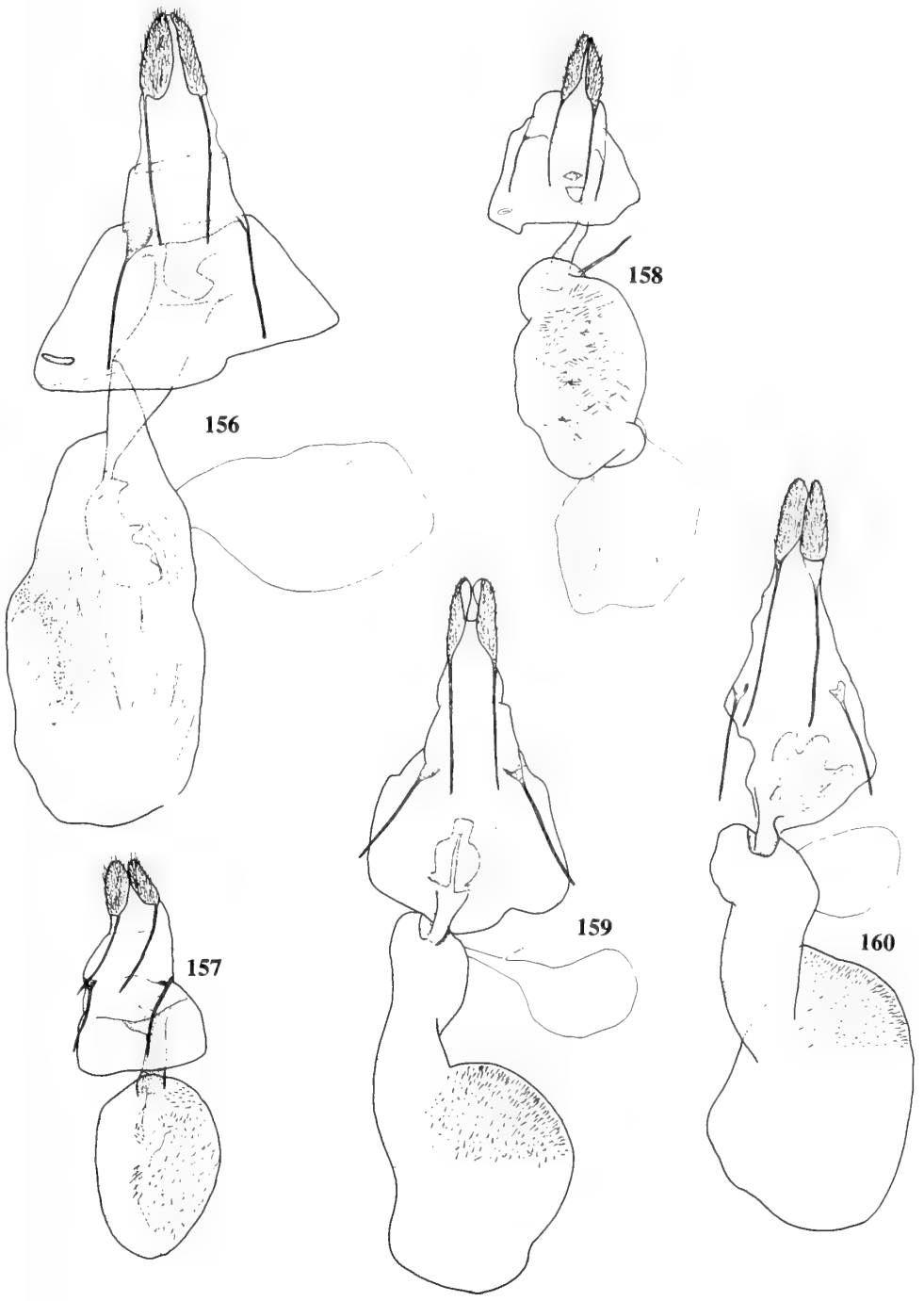

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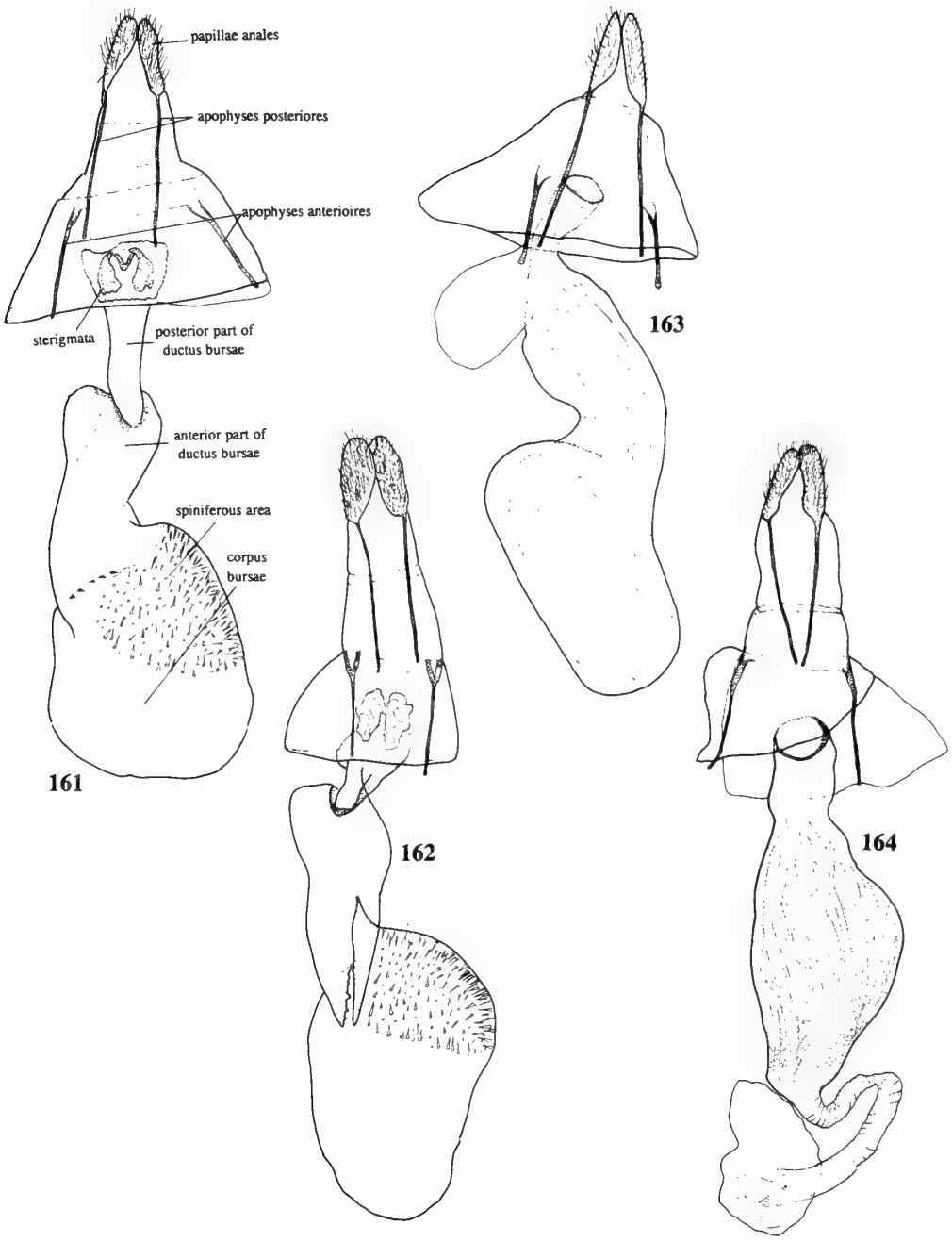

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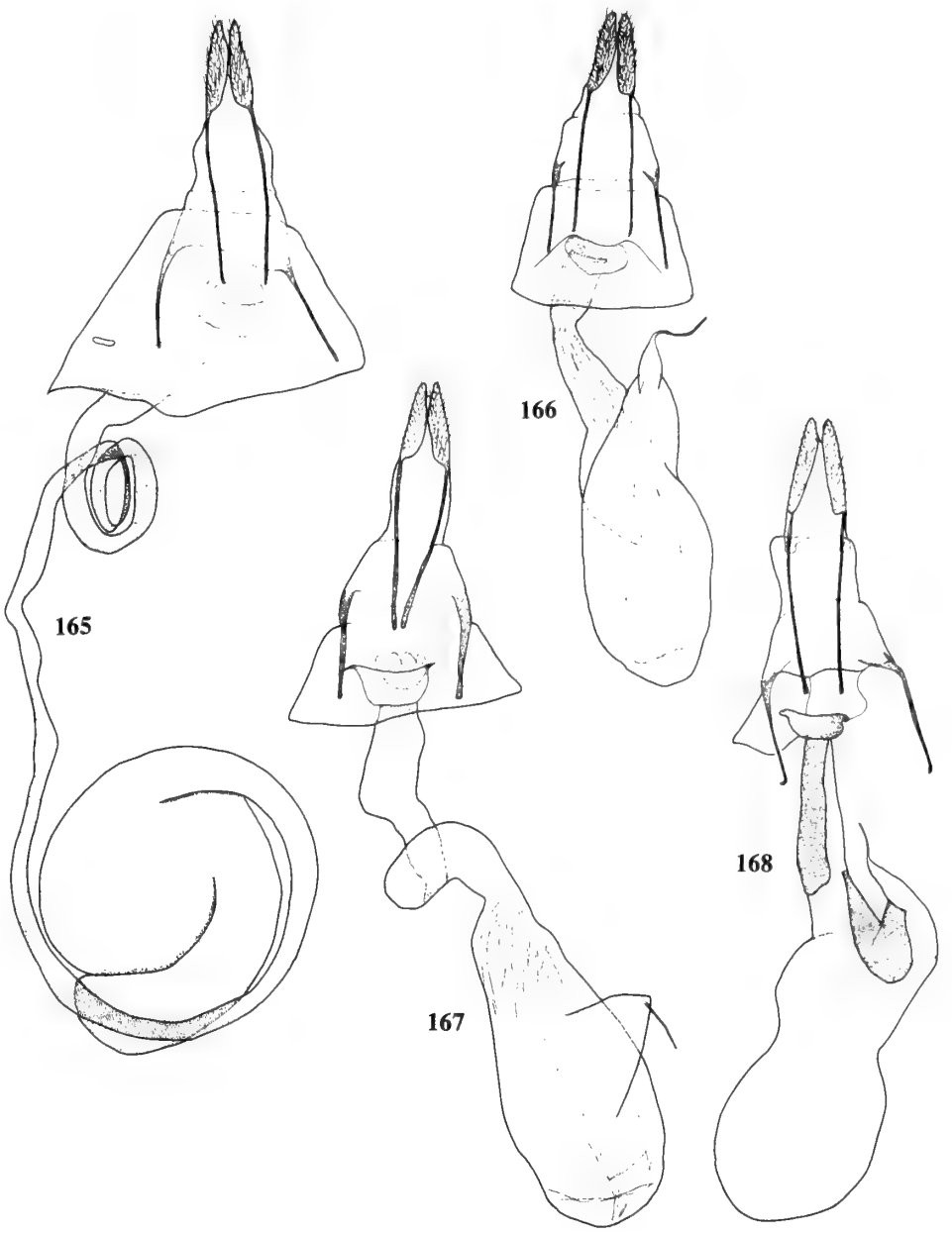

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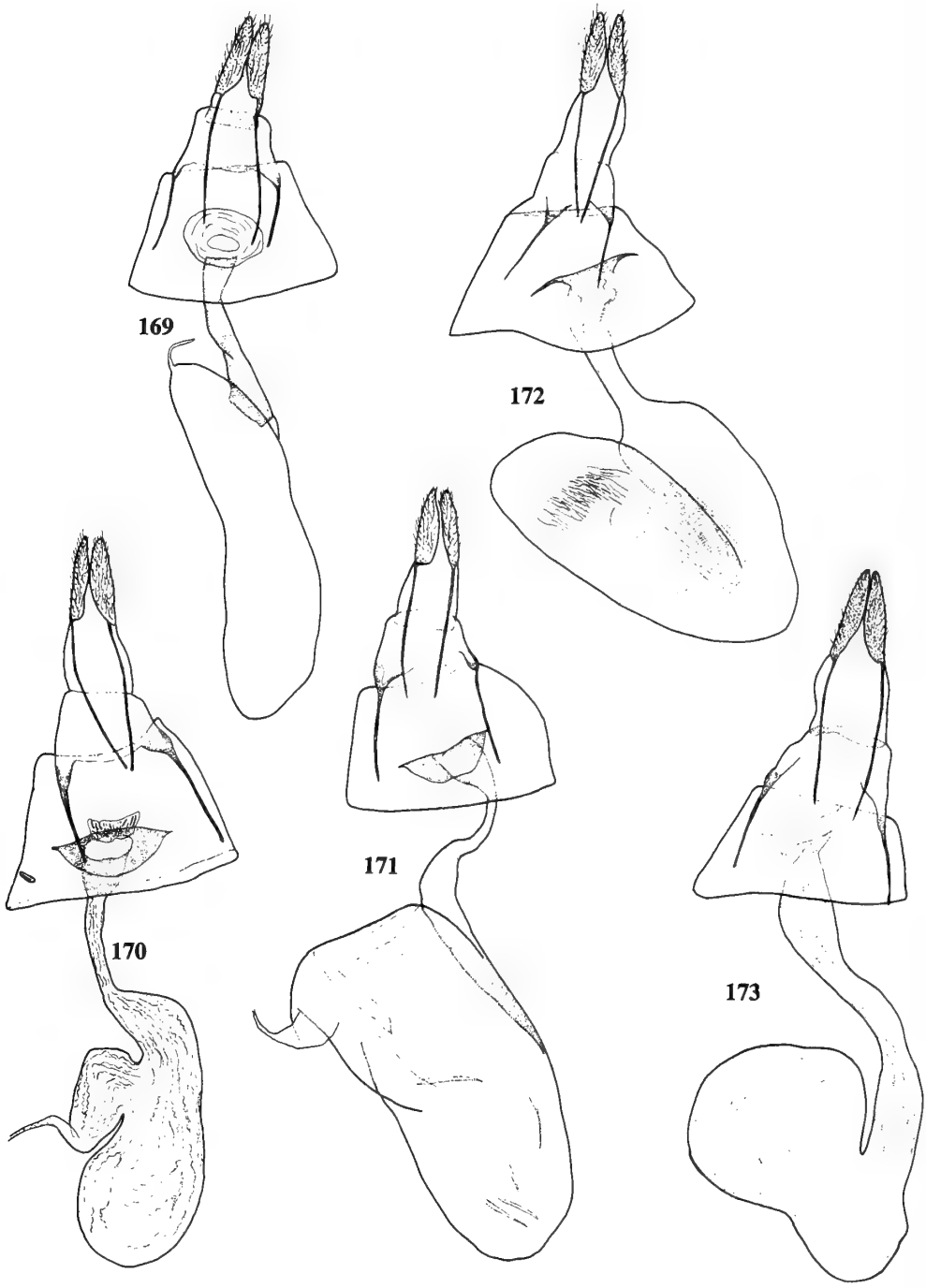

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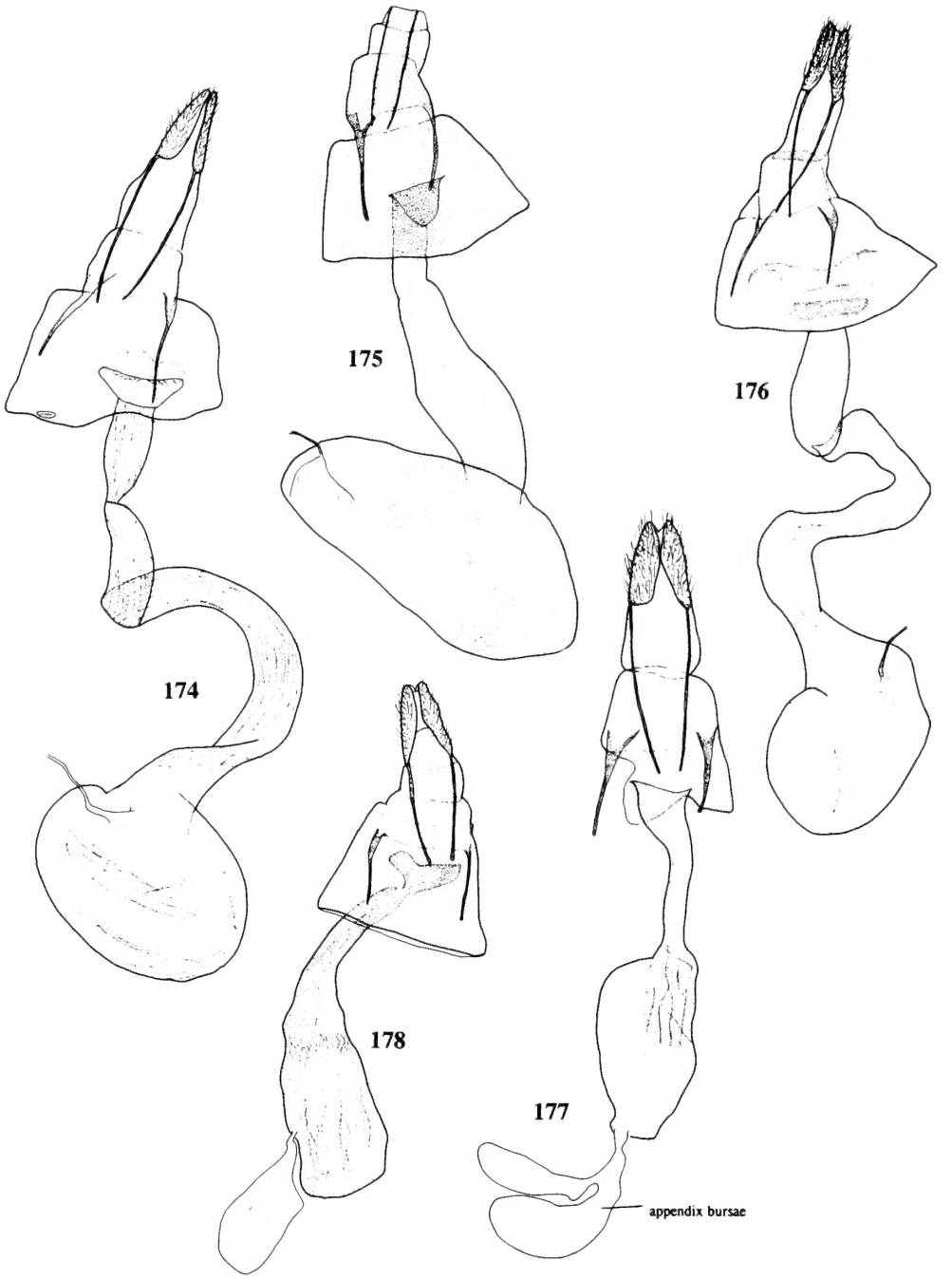

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